ELECTRICAL TIMES

THURSDAY
1 NOV.
1951
NINEPENCE

UNDERGROUND DISCONNECTING BOXES

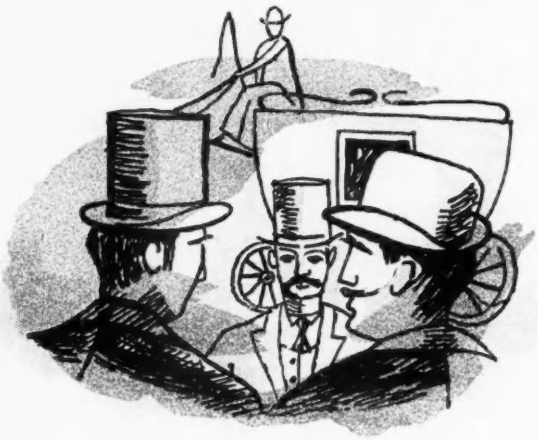
Three-way (Parallel type) Underground Disconnecting Box, fitted with Cartridge Fuse-links in Porcelain Carriers.

REMEMBER GENEROUSLY
SAT · NOV 10

The Range of HENLEY Underground Disconnecting Boxes meet all normal requirements for isolating or interconnecting in low tension distribution network. All boxes incorporate special HENLEY features, such as diving bell lids, porcelain insulation designed to prevent creepage across the face of compound, etc.; supplied with or without C.I. Pits and Pavement Frames and Covers. Fitted with Cartridge Fuse-links or Wedge Type links, as required. Please ask for Catalogue 27.

HENLEY

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.
51-53 HATTON GARDEN, LONDON, E.C.1



1901

In August 1901, just six months after the Victorian era had ended, a newly founded company with very small premises at Stansted in Essex manufactured the first bonded mica sheets ever made in this country. Its name was 'The Mica Insulator Co. Ltd.'

1951

Very soon it had outgrown its Stansted works and another at Walthamstow. As the variety of its products increased it changed its name to include them and became 'The Micanite and Insulators Company Ltd.,' and finally established itself on the site of the present main works at Walthamstow. It also commenced the manufacture of Empire varnished insulating materials, Paxolin laminates, Panilax laminates and Panilax moulded resin, and High Voltage Bushings and Insulators. Today M & I have several other factories and their products are world renowned.

---

m and i *The Micanite and Insulators Company Ltd.*
Empire Works, Blackhorse Lane, Walthamstow, London, E.17.

MANUFACTURERS OF MICANITE (BUILT-UP MICA INSULATION). FABRICATED AND PROCESSED MICA. PAXOLIN LAMINATED MATERIALS. PANILAX LAMINATED MATERIALS AND MOULDINGS. EMPIRE VARNISHED INSULATING CLOTHS AND TAPES. HIGH VOLTAGE BUSHINGS AND TERMINALS

'ENGLISH ELECTRIC'

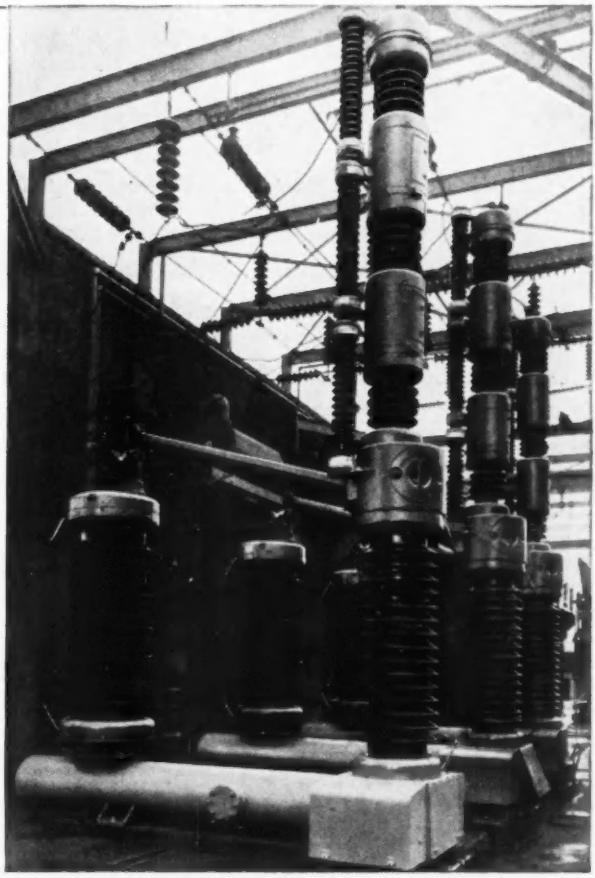
switchgear

High voltage air-blast circuit-breakers for outdoor service

Tested for breaking charging currents of long lines

•

Illustrated is a 165-kV, 3,500-MVA air-blast circuit-breaker recently tested for breaking line charging currents at Fontenay, France.



The ENGLISH ELECTRIC Company Limited

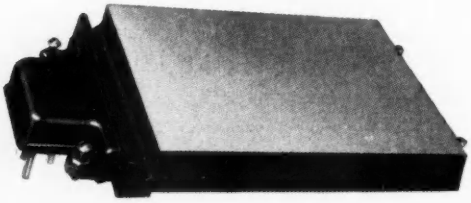
QUEENS HOUSE, KINGSWAY, LONDON, W.C.2.

Switchgear Department, Stafford

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL

SH.1 A

FORD'S GRILL BOILERS



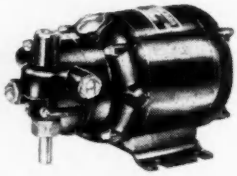
SUPPLIED FOR FOLLOWING MAKES OF COOKERS

CREDA • EECo. • EDA • GEC • REVO • JACKSON

Ford's Grill Boilers while cheap, are the Hallmark of efficiency and reliability and will give a good saving on your service cost.

A. C. FORD Ltd., Lawley St., DUDLEY

Geared
Electric Motor Units

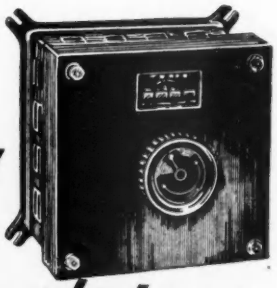


Any Speed reduction
Max Torque 4 lb. in.
6 in. × 3½ in. dia. $\frac{1}{50}$th H.P.

- **Induction Shaded Pole**
- **Series and Repulsion**
- **Variable-Speed (Rheostat)**

CITY ENGINEERING Co. (Boreham Wood) Ltd.
Manor Way - Boreham Wood - Herts.

Shunt Field Regulators

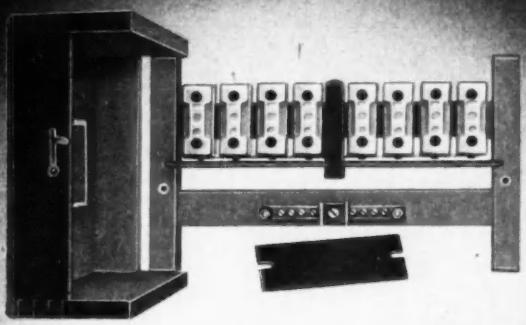


For Motors, Generators and Alternators. Also as Series Regulators for voltage, heat and speed control. We shall be pleased to send full particulars and prices on request. And remember, the advice of Cressall Technicians is always available.

CRESSALL

Registered Trade Name of
THE CRESSALL MANUFACTURING CO., LTD.,
Tower Street, Birmingham 19.
Telephone: ASTon Cross 2666 (3 lines)
Telegrams: "OHMIC," Birmingham.

You cannot buy better gear



BILL "HINGELESS" HARDWOOD FUSEBOARDS.

MADE FOR 5/15, 15, 20 AND 30 AMPERES, 250 VOLTS; 1-12 WAY; DOUBLE POLE, SINGLE POLE AND NEUTRAL.

MIXED AMPERE FUSEWAYS TO SPECIAL ORDER.

ARC DAMPING TYPE FUSES (REWIRABLE).

DETACHABLE COVER FOR EASY WIRING.

REASONABLE DELIVERY FROM WORKS OR LOCAL DEPÔT STOCKS THROUGH YOUR USUAL WHOLESALER

FULLY ILLUSTRATED IN NEW CATALOGUE G551 ON REQUEST.

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
BIRMINGHAM 20

LONDON A.W.ZELLEY & W.N.PAYNE
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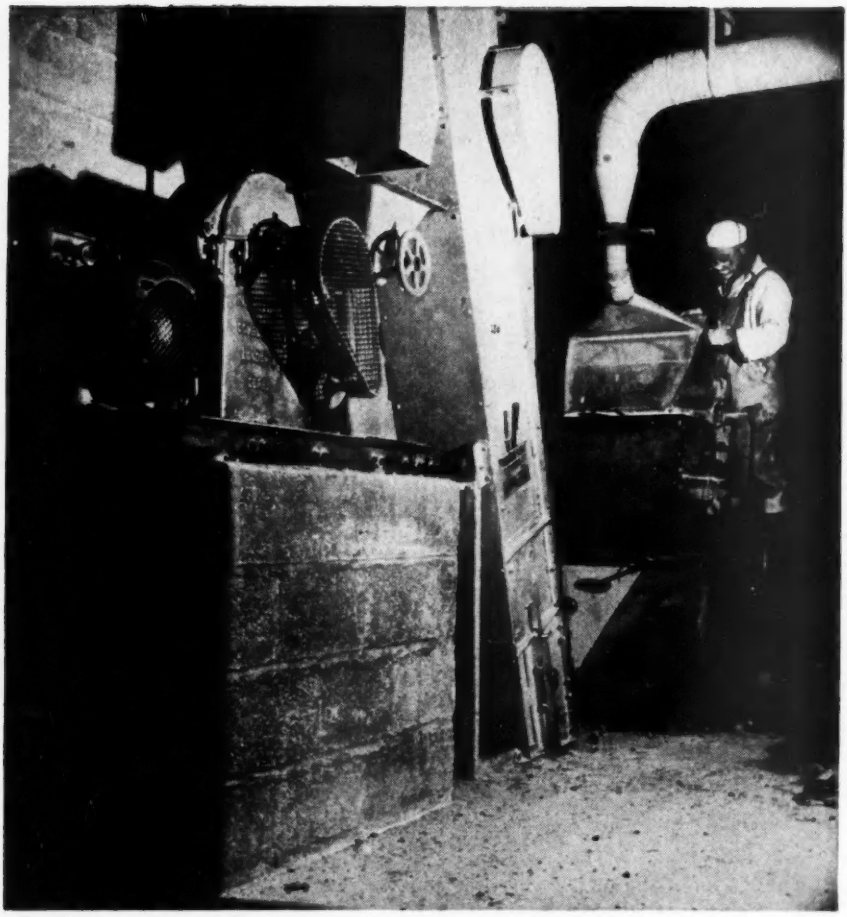
SCOTLAND J.D.HARRIS



Other people's jobs

Under the watchful eyes of Johnny Neal, various clays undergo the first of the transformations which turn them into Belling fire bars and insulators. He controls the mixture of these ingredients in this pulverizer, a vital manufacturing stage which can make or mar the finished product. From here, the mixture goes to the presses for moulding into shape and then, after drying, on to a two-day journey through the tunnel-kiln. Johnny started at Bridge Works when he was fourteen. His experience is one of the reasons why Belling enjoy such a reputation for reliability and first class workmanship.

You can't beat a "Belling"

BELLING & CO. LTD., BRIDGE WORKS, ENFIELD, MIDDLESEX. HOWARD 1212
CRC380

General View of Abbey Works

THE ABBEY WORKS, built adjacent to the existing Works, consists of a Melting Shop, 80″ Continuous Hot Strip Mill, Three-Stand Cold Reduction Mill and ancillary plant.

PRODUCTS OF THE COMPANY ARE :—

Hot Rolled and Cold Reduced Sheets and Coils up to 72″ sheared width in qualities for auto-bodies, vitreous enamelling, extra deep drawing, etc. · Galvanized Flat and Corrugated Sheets · Electrical Sheets for Dynamos and Transformers · Blackplate · Hot and Cold Reduced Tinplate both hot dipped and electrolytically tinned · Plates ⅛″ thick and upwards by up to 72″ wide · Flange, Bullhead and Bridge Rails · Fishplates · Steel Railway Sleepers · Sections · Slabs · Basic Pig Iron · Coke and By-Products · Sized Limestone.

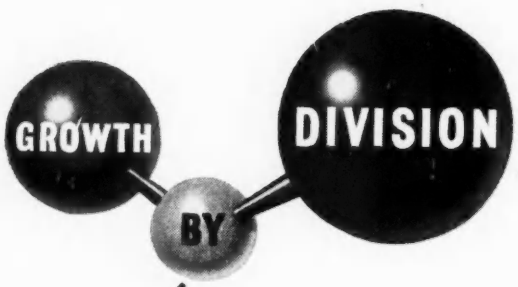
Export Sales Organisation for Mild Steel Flat Rolled Products

RTSC EXPORTS LIMITED

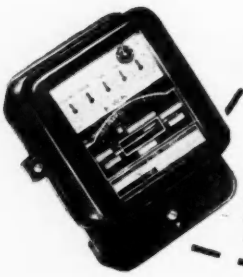
47 PARK STREET, LONDON, W.1.

THE STEEL COMPANY OF WALES LIMITED

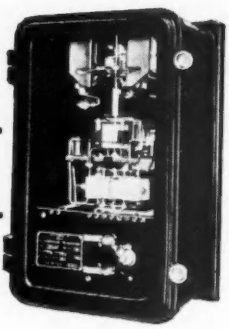
ABBEY WORKS · PORT TALBOT



We measure and control the flow of electricity and liquids: *that* is the theme of our business. And here are some examples of what we make.



ELECTRICITY METERS
Made at Dobcross by our Electricity Meter Division



TELEMETERS
Made at Kennington by our Remote Control Division

LIQUID METERS
Made at Oldham by our Hydraulics Division

MEASUREMENT LTD

ELECTRICITY METER DIVISION, Tameside Works, Dobcross, Near Oldham, Lancs. Tel. No. Delph 291
HYDRAULICS DIVISION, 119 Union Street, Oldham, Lancs. Tel. No. Manchester Main 6432/4
REMOTE CONTROL DIVISION, Fitzalan St. Works, Kennington Road, London, S.E.11. Tel. No. Reliance 2406

A Company of the Parkinson & Cowan Group

ELECTRIFICATION OF KIRKUK OIL FIELDS

— IRAQ PETROLEUM COMPANY

The development of the Kirkuk Fields and the installation of a processing plant capable of handling an output of 20 million tons per annum of crude oil necessitated an electrification scheme of major proportions. The scheme comprised the building of a new power station, Kirkuk 'B,' having a capacity of 70,000 kVA, and the construction of a distribution network with two 66 kV outdoor sub-stations and eighteen 11 kV sub-stations.

J. & P.—who have played a leading part in many Middle East electrification schemes since they undertook the first electrification scheme at Abadan in 1922—were awarded the following contracts:—

1. The planning and installation of the entire cabling of Kirkuk "B" Station.
2. The design and erection of the two 66 kV outdoor sub-stations.
3. The design and erection of 40 miles of 66 kV overhead line, and associated 11 kV distribution lines.
4. The entire cabling of the eighteen sub-stations and the installation of the associated cable systems.
5. Cabling of the Process Plant.
6. The complete electrification of a new township planned to comprise 1300 houses. The work included the underground distribution network, house services, street lighting, etc.

For electrification schemes of this nature, J. & P. are in a unique position. Not only are they manufacturers of so much of the equipment, but their extensive experience in the planning and execution of such schemes enables them to relieve the customer's own staff of much of the engineering design work and to carry out the installation.

The mark that means that "little more" *in quality*

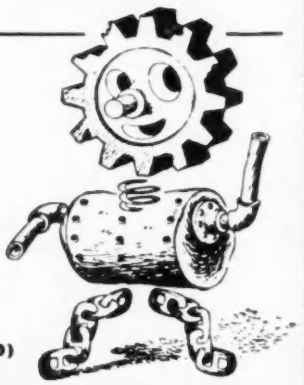
JOHNSON & PHILLIPS LTD., CHARLTON, LONDON, S.E.7

WANTED !

NEW STEEL

alias JACK SCRAP

(MAY BE IN HIDING OR DISGUISED)



Bring your detective powers to bear on the search for scrap and you'll probably unearth tons of it disguised as old plant you never use or hidden in out of the way corners of your warehouses, stockrooms and yards.

The new steel every industry needs can be made from the old steel it has done with. Find all you can. Round it up. Turn it in.

WANTED
from the
ELECTRICAL INDUSTRY

Old engines and transformers and *every kind* of general and process scrap and obsolete plant

Your scrap merchant will help with dismantling and collection.

SPEED THE SCRAP *SPEED THE STEEL*

Issued for the STEEL SCRAP DRIVE by the British Iron and Steel Federation, Steel House, Tothill Street, London, S.W.1

T.41

IN *YOUR* MOMENT OF REMEMBRANCE

Please Remember Generously

YOUR HELP IS NEEDED MORE THAN EVER

POPPY DAY

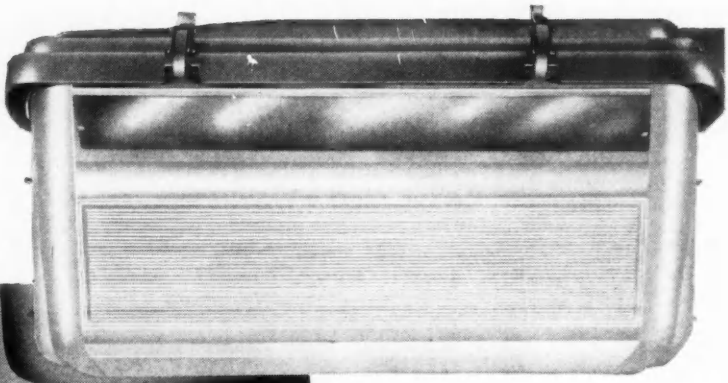
Sat. Nov. 10

Issued by British Legion Poppy Day Headquarters, Pall Mall, London, S W.1.

(Registered under War Charities Act, 1940)

This space has been generously donated by

The British Thomson-Houston Co. Ltd., Rugby, Warwickshire



G.E.C.

2/40 PERSPEX REFRACTOR LANTERN

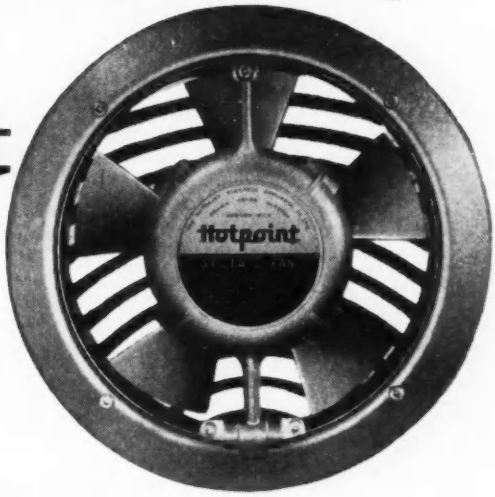
The G.E.C. 2/40 lantern is intended for side road lighting and employs an entirely new system of optical control using OSRAM fluorescent lamps.

Principal features include :-

- Specially designed perspex refractors for the main optical system.
- Refractors sealed on the inside of a totally enclosing perspex bowl.
- Smooth interior and exterior for ease of cleaning.
- Even brightness of bowl giving enhanced appearance and improved road lighting.
- Single piece die-cast aluminium body supplied either for top or side entry fixings.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

NOW ventilation by Hotpoint



WINDOW FITTING

VECTA 7-inch fan

Before settling on a ventilating system consider and investigate this new 7-inch fan. It has been specially designed for Hotpoint whose reputation for dependability is undisputed. Engineers who added speed to the Spitfire and Hurricane and are now researching in Jet propulsion, have applied their knowledge of air movement to this fan design.

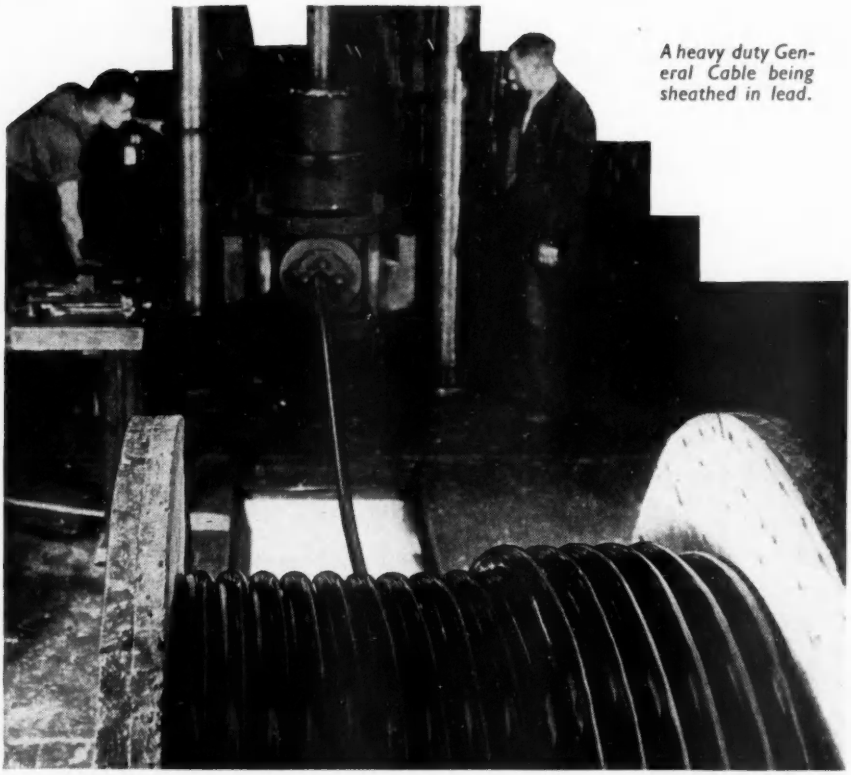
With an extraction rate of 17,500 cu. ft. an hour it is suitable for public rooms, offices and homes, flats, factories and farms. Send for detailed specification list HEA.382/1.

Hotpoint

domestic appliances

THE HOTPOINT ELECTRIC APPLIANCE CO. LTD., PETERBOROUGH

Member of the A.E.I. Group of Companies



A heavy duty General Cable being sheathed in lead.

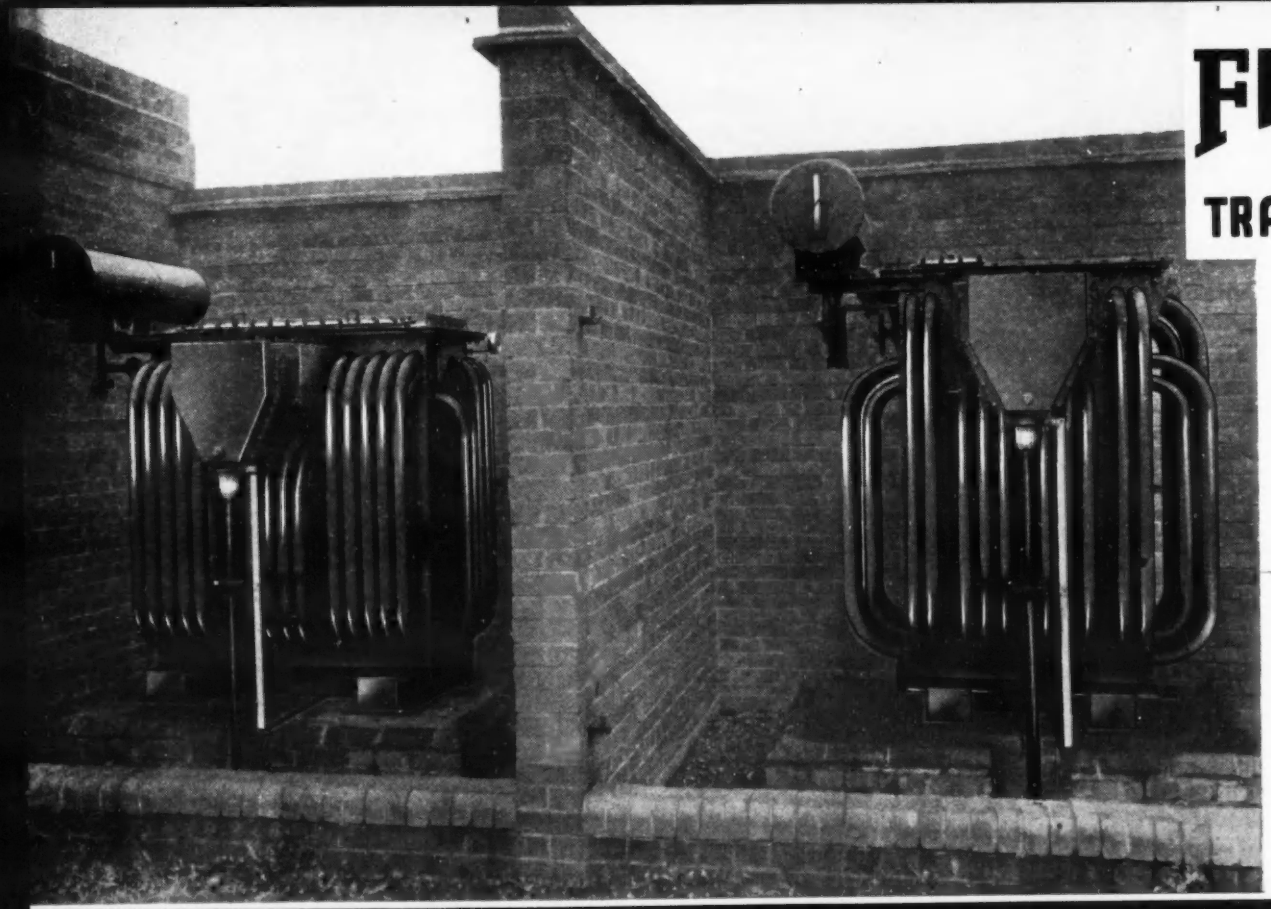
READY FOR DUTY —ANYWHERE

All over the world General Cables are giving, day in, day out, satisfactory service. Extremes of heat and cold, exposure to moisture and the elements, however severe the conditions General Cables will not be found wanting. Manufactured on some of the most modern plant in the world General Cables are *tested* for quality — plus !

GENERAL CABLES

MADE AT LEATHERHEAD

The General Cable Manufacturing Co. Ltd. Leatherhead, Surrey. 'Phone: Leatherhead 3021/4. 'Grams: "Isolde" Leatherhead. Depots at 204/206 Newhall St., Birmingham. 54a Newton St., Manchester. 55/63 Washington St., Glasgow, C.2



FOSTER
POWER TRANSFORMERS

A B.E.A. Sub-station equipped with Foster Transformers Serving a large residential district

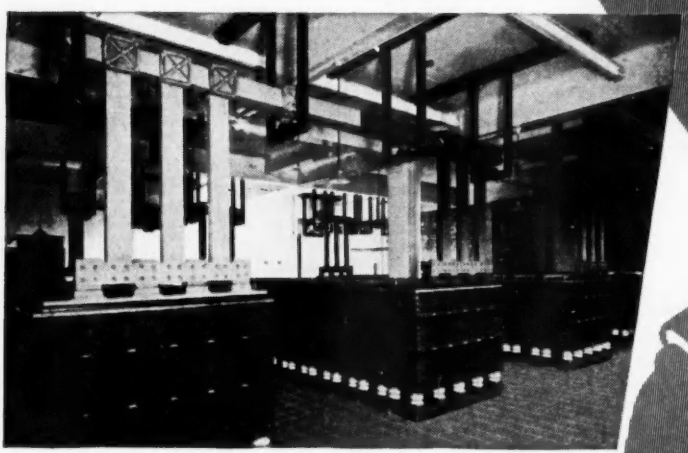
Foster Transformers & Switchgear Ltd

A "LANCASHIRE DYNAMO" COMPANY

SOUTH WIMBLEDON, LONDON, S.W.19

P & G BATTERIES in the public service

REMEMBER GENEROUSLY SAT · NOV 10



These batteries in the Museum Telephone Exchange, London, are typical of many P & G batteries installed throughout the country to maintain telephone efficiency. Our 60 years' experience in the battery business covers a vast and varied field; including batteries for generating stations, railway electrification work and emergency lighting systems. P & G 3 point service working on the sound principle of two heads being better than one, exists to provide: **1.** *Detailed specifications or an impartial second opinion on any scheme.* **2.** *Complete equipment and installation.* **3.** *Regular inspection and report.*

2 *heads are better than* **1**

PRITCHETT & GOLD and EPS Co. Ltd
50 GROSVENOR GARDENS · LONDON · SW1

P.G.17

Batteries for Switch Closing, Switch Tripping, Emergency Lighting, Supervisory Control, Telephones, Supply to Auxiliaries

MOTOR BREAKDOWNS WASTE TIME

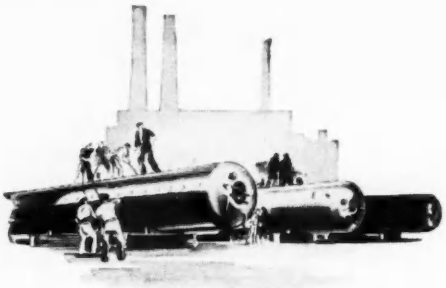
It is always wise to have a standby motor in case of emergency. Let BROOK rewind one of your obsolete motors for this purpose.

FOR SPEEDY REPAIRS
AND REWINDS TO
MOTORS OF ALL
TYPES AND MAKES

Send them to

No.8 REPAIR WORKS BROOK MOTORS *Ltd* **HUDDERSFIELD**

I.KN.200



BABCOCK

Steam Raising Plant

The capacity of Babcock boilers installed and on order has reached a total of approximately

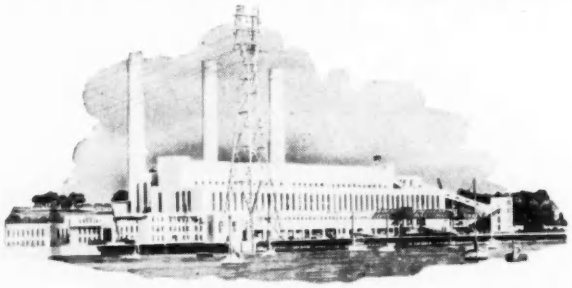
3,600,000,000

lb. of steam per hour

This colossal total is an indication of the outstanding importance of Babcock steam raising plant to the world's economy, in the fields both of power generation and industry, for it serves both in equal measure.

Babcock steam raising plant does literally serve the world, is the product of a worldwide organisation, is backed by a worldwide service. It embraces everything required for reliable, economical production of steam, on a large or small scale and up to the highest temperatures and pressures.

CLIFF QUAY power station, one of the many B.E.A. stations equipped with BABCOCK steam raising plant, has nine P.F. fired High Head boilers each to evaporate 365,000 lb./hr. at 635 lb/sq. in., 850°F.



BABCOCK & WILCOX LTD.

BABCOCK HOUSE, FARRINGDON ST., LONDON E.C.4.

A WORLDWIDE ORGANISATION

WHY DON'T YOU ASK ME?

Yes! Ask her. Ask your customer what she looks for in a cooker—in addition to the meat ration! B.N.E. asked Supply Authorities serving one and a quarter million consumers what they wanted, and incorporated their requirements in the Model C.49. As a result the specification includes more desirable features than have ever before been built into one cooker, not the least of them being the very attractive appearance . . . . Send for full details now.

- ★ CAST-IRON MAIN FRAME AND HOB.
- ★ CONFORMS TO B.S. 1195 AND E.D.A. SPECIFICATION FOR INTERCHANGEABILITY.
- ★ VERY LARGE OVEN AND HOT-CUPBOARD WITH DROP-DOWN COUNTERBALANCED DOORS.
- ★ HOB AND OVEN EQUIPMENT DESIGNED FOR RAPID REMOVAL AND CLEANING.
- ★ EASY CONVERSION FROM 2 TO 3 PLATE.

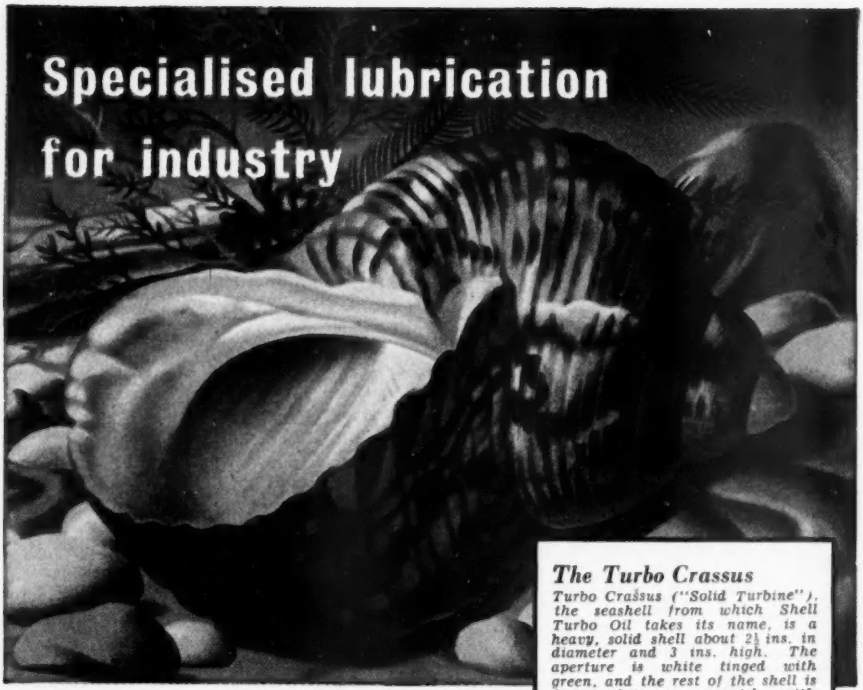
The B.N.E. Model C.49

The Cooker that has everything

BRITISH NATIONAL ELECTRICS LTD.

A Product OF JOHNSON & PHILLIPS LTD

THE DOMESTIC APPLIANCES SECTION OF
JOHNSON & PHILLIPS LTD.
NEWARTHILL · MOTHERWELL · SCOTLAND.



The Turbo Crassus

Turbo Crassus ("Solid Turbine"), the seashell from which Shell Turbo Oil takes its name, is a heavy, solid shell about 2½ ins. in diameter and 3 ins. high. The aperture is white tinged with green, and the rest of the shell is dirty white or greenish, with angular black or brown patches on the ribs. Found off the coasts of North Australia and New Caledonia.

SHELL TURBO OIL

SHELL TURBO OILS are highly refined oils containing anti-oxidant and anti-rust additives. They separate readily from water during prolonged service and have outstanding oxidation stability. Available in a range of viscosities, they are recommended for steam, gas and water turbines, bearings of high speed enclosed crankcase steam engines, and certain other circulating systems where oils of turbine quality are required. Shell Turbo Oils are approved by all the leading turbine builders.

The wide Seashell range of specialised industrial lubricants is marketed in nearly every country of the world. There is a Seashell grade for *every* industrial use—and each is available everywhere in the same high quality.

SHELL LEADERSHIP IN LUBRICATION

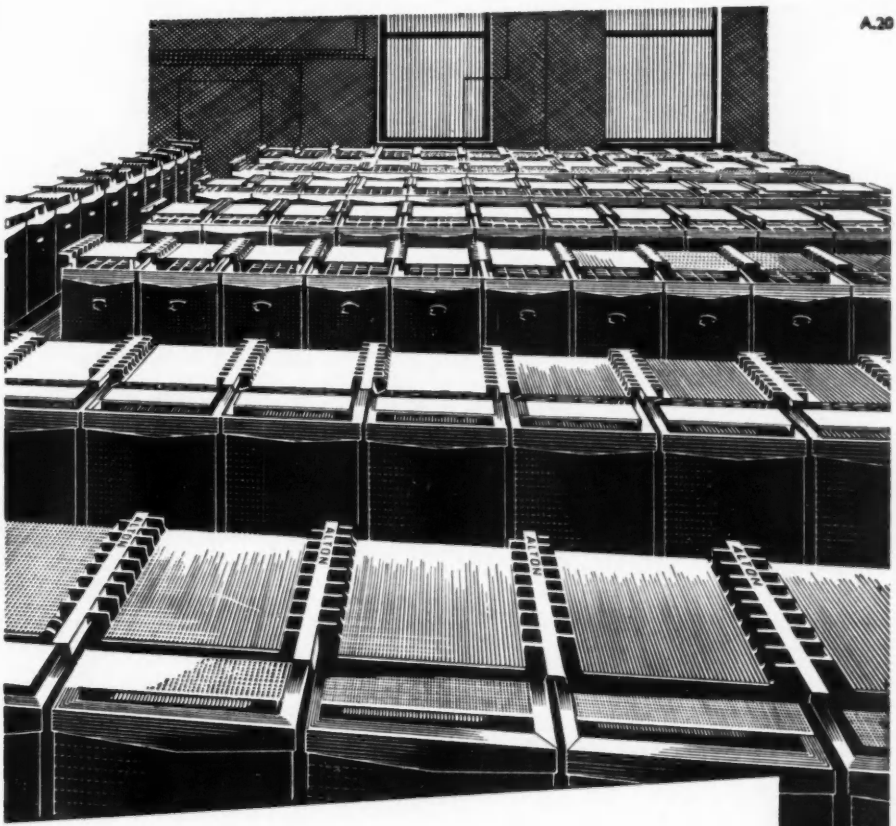
WORLD-WIDE INDUSTRIAL RESEARCH

Seashell Oils are produced as the result of *world-wide research*. At Shell's great Thornton Research Centre, and at other Shell Research Centres in Europe and America, scientists and technicians spend their lives studying the special lubrication needs of every branch of industry. The rewards of this research are the Seashell oils—each developed to solve a *specialised* lubrication problem. This is the solid basis upon which Shell has built up its world-wide *leadership in lubrication*.

CALL IN A SHELL LUBRICATION ENGINEER

Shell Lubrication Engineers will be pleased to provide further information and to make specific recommendations for particular purposes. You can be sure of Shell lubrication—it is *specialised* lubrication.

A.20



Alton has been exporting batteries for thirty years. In installations in sixty-five countries Alton Batteries, in capacities from 10 to 15,000 ampere-hours, are giving the service only good batteries can give. Alton, in any language, means good batteries and firm delivery dates.

ALTON

BATTERIES OF MERIT

THE ALTON BATTERY COMPANY LTD
Alton, Hants: Telephone: Alton 2267 and 2268
Telegrams: Battery, Alton

Alton can also supply renewal plates for all makes of battery, British & Continental

B

THE CHEAPEST MEANS OF MAINTAINING A CONSTANT SUPPLY VOLTAGE –

There are 26 standard models of the BERCO "REGAVOLT", most of them giving voltage ranges from zero to 325 volts from a 250 volt, 50 cycle supply, but there are 2 models rated at 3 and 6 K.V.A. respectively, which have been specially designed for voltage stabilising purposes, enabling you to keep your supply constant, even if the mains fluctuate by ±15%.

The outstanding features are

- **Generous design**
- **Robust construction**
- **Rugged self lubricating brushes**

Write for list 605

THE BRITISH ELECTRIC RESISTANCE CO. LTD

QUEENSWAY · PONDERS END · MIDDLESEX

Telephone : HOWard 1492 *Telegrams : Vitrohm, Enfield*

BERCO

REGAVOLT

Regulating Transformer

B.R.3111-CH

THOUSANDS have been SOLD...

No. 1482

ROUND CORNERED PAVEMENT COVERS AND FRAMES

16 Standard Sizes

Also makers of: Roadway Covers and Frames · Lamp Pillars and Brackets · Kiosks and Pillar Casings

ESTABLISHED 1814

HARDY & PADMORE LTD., WORCESTER. Tel: WORCESTER 3215

M-W.101

. . . just the job for M-V Atomic Hydrogen welding equipment

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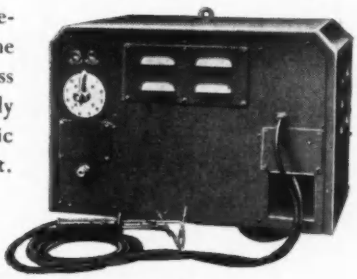

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METROVICK *Equipment for More Efficient Welding*

J/E 004

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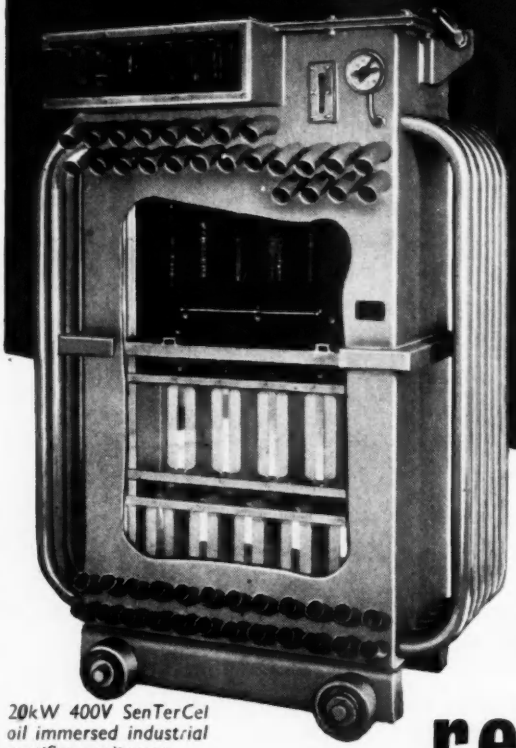

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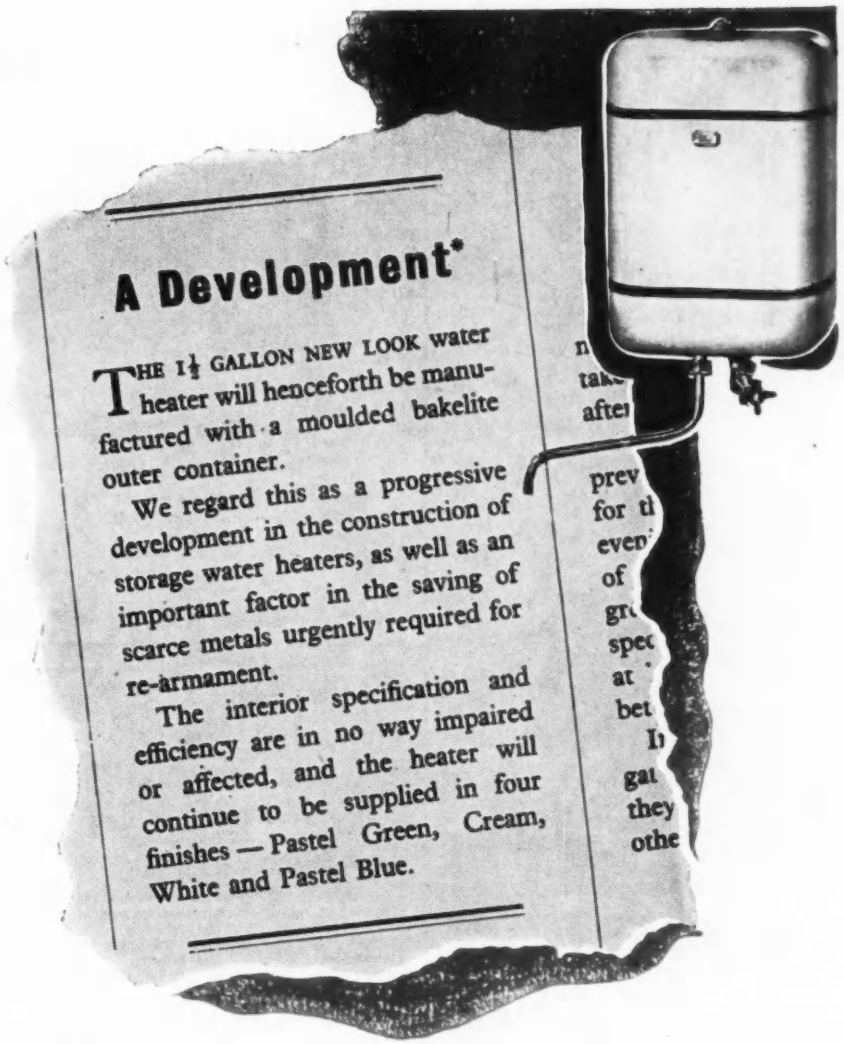

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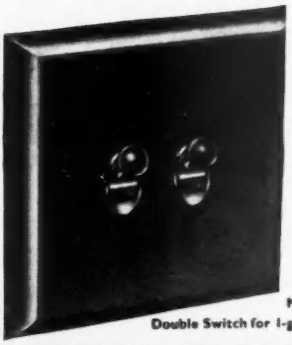

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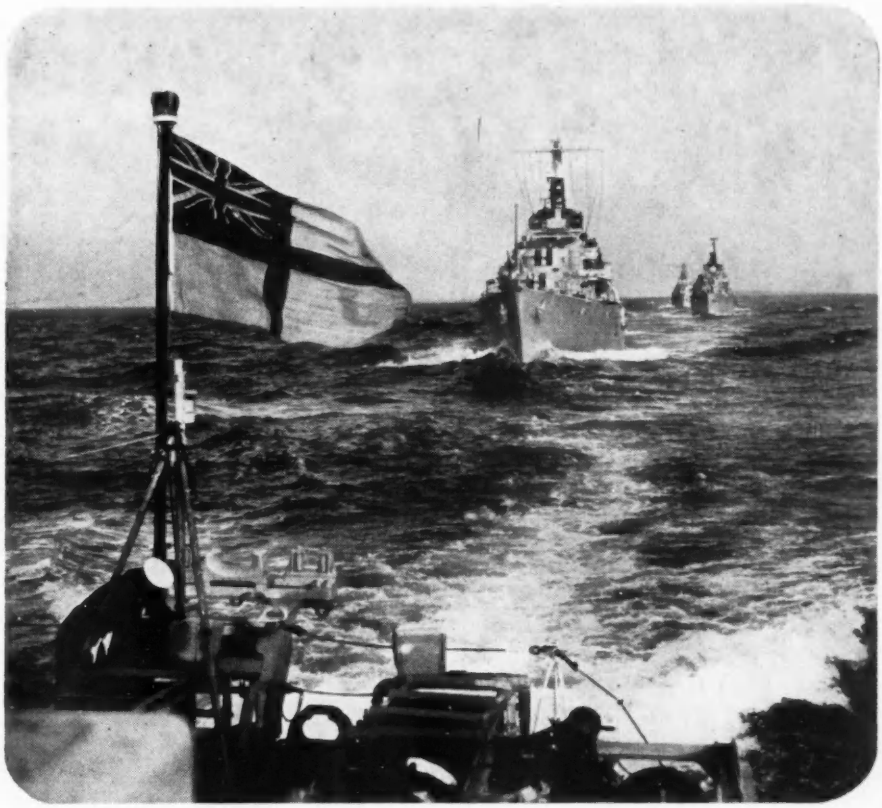

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(a) The cable was laid in the form of a loop, 1 mile in length; and was connected in series through isolators.

(b) No maintenance was carried out other than the cleaning of sealing end porcelains.

(c) No technical faults occurred on the cable.

(d) The performance of the cable was most satisfactory.

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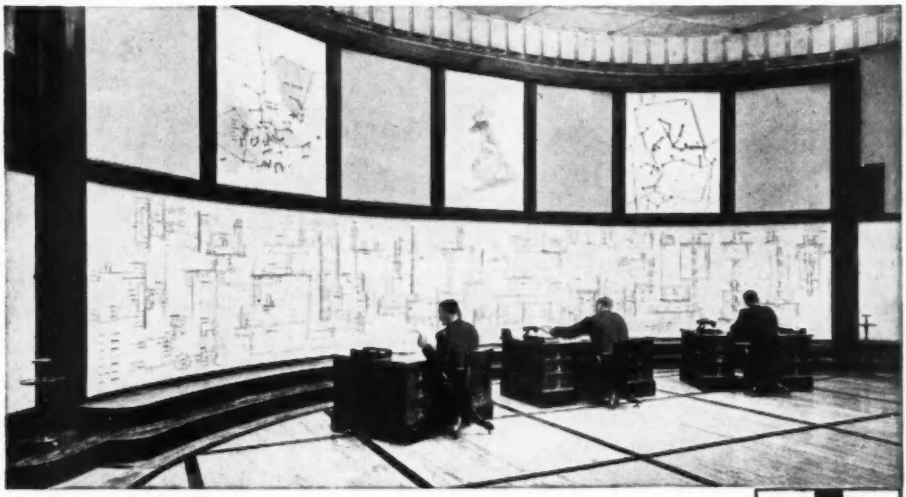

The A.T.M. MOSAIC DIAGRAM gives a CLEAR PICTURE

These diagrams consist of small interchangeable plastic squares, some plain and some bearing appropriately coloured symbols. They are mounted on pierced metal strips by means of simple clips and the accuracy of construction is such that the finished board has a smooth uniform appearance.

Should changes occur such as, for example, re-arrangement of feeders, the diagram can be quickly revised. Thus a clear up-to-the-minute picture of his entire network can be seen at a glance by the control engineer.

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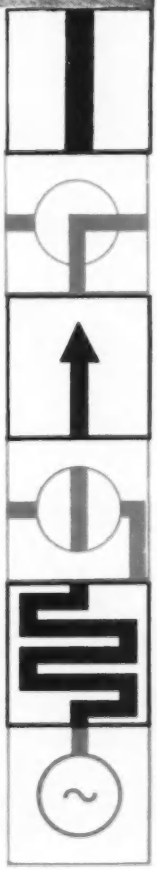

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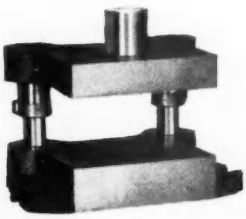

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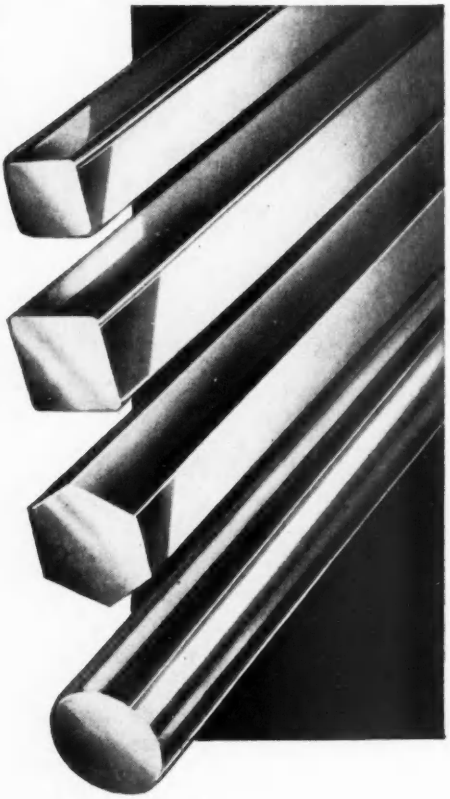

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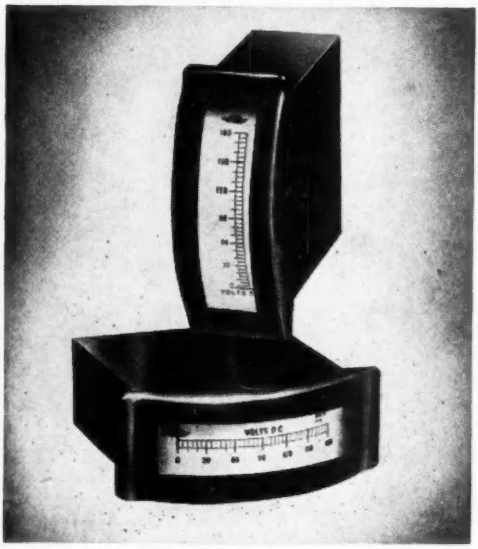

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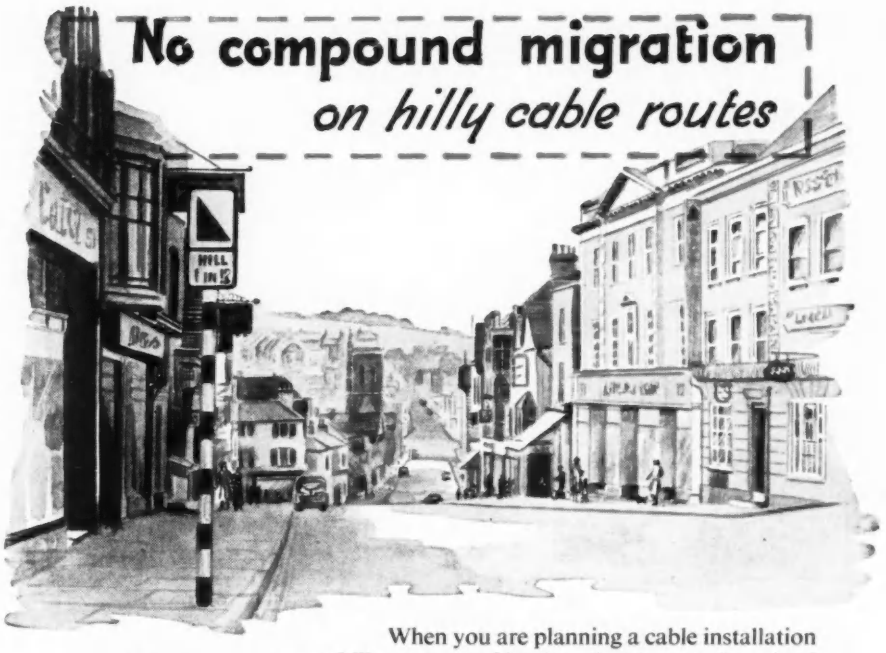

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For further information write for Publication No. 280V.

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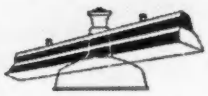

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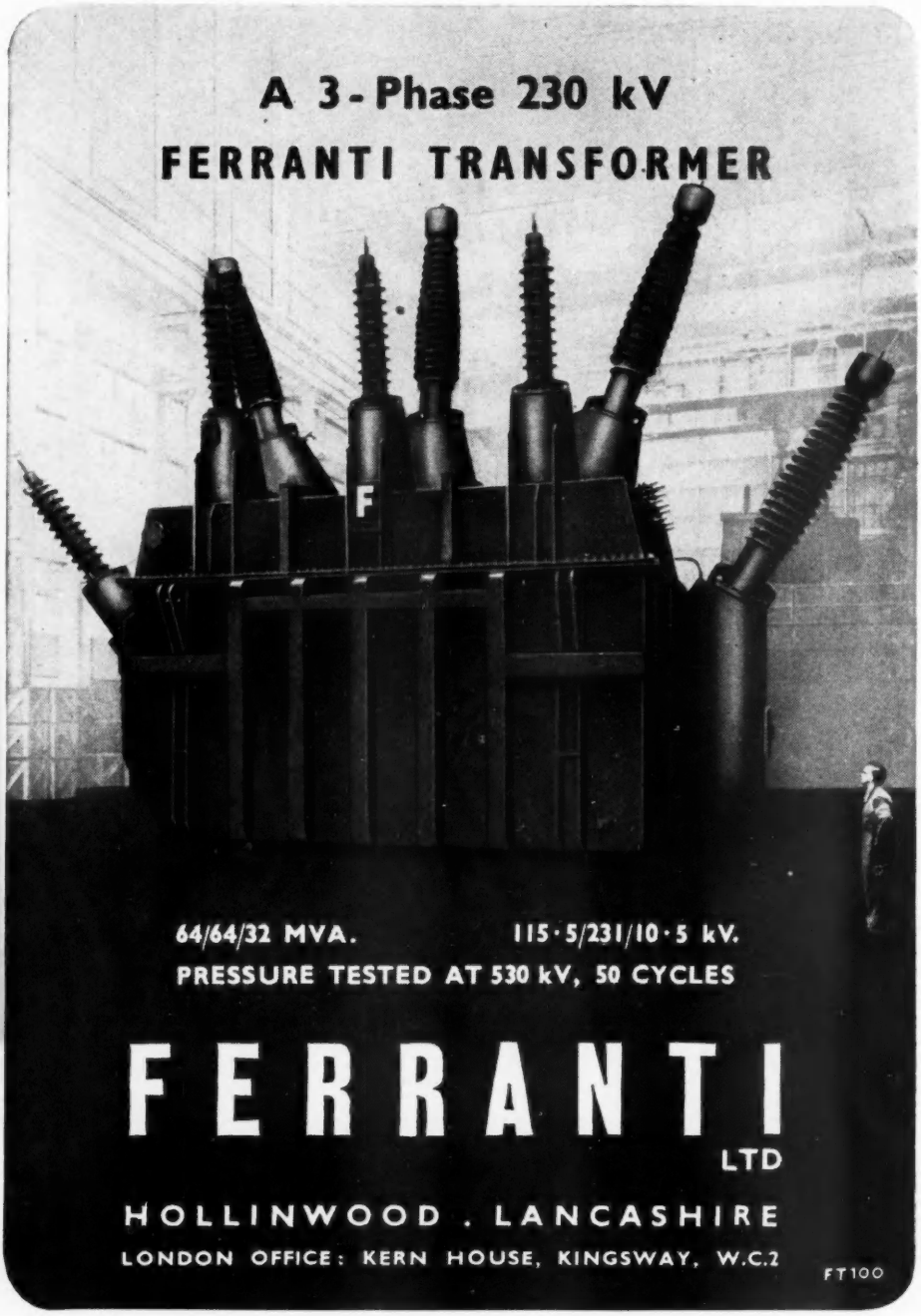
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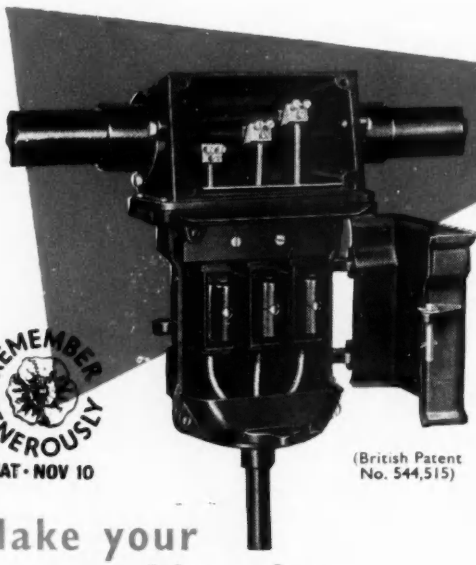
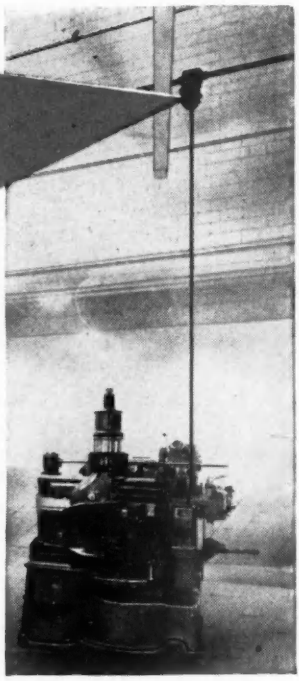


(British Patent No. 544,515)



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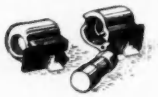

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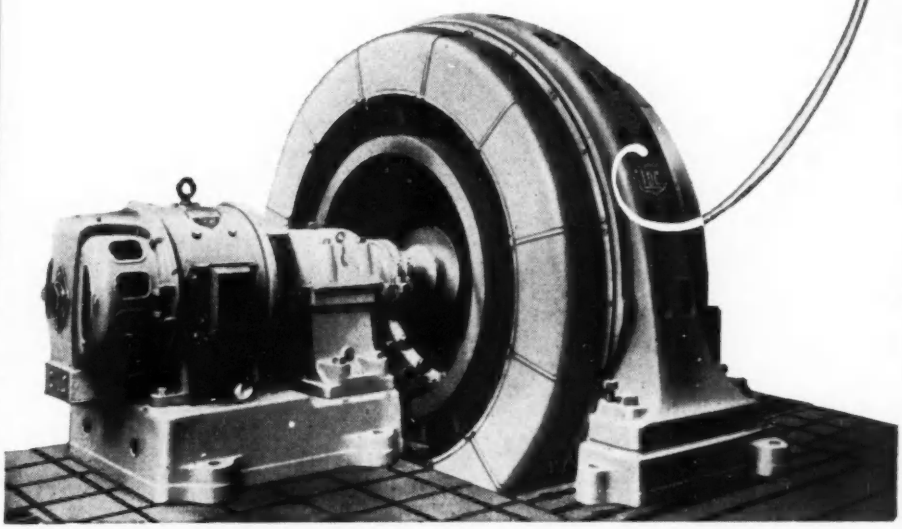

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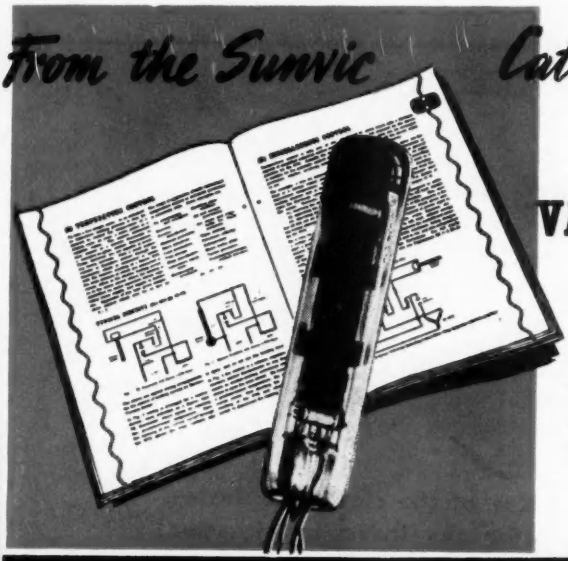

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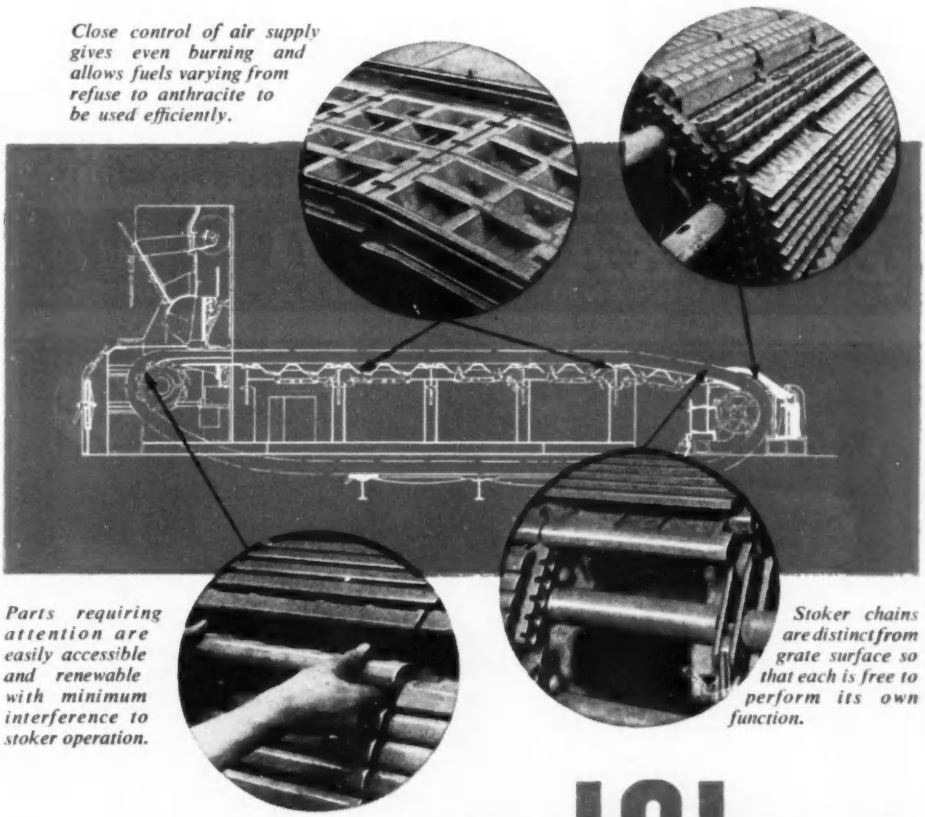

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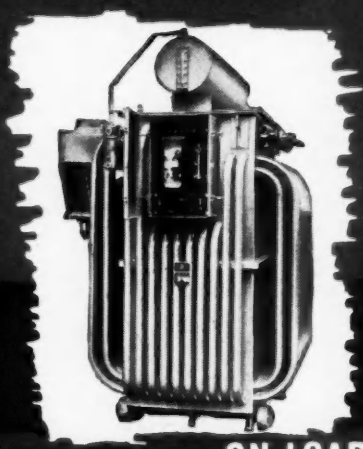

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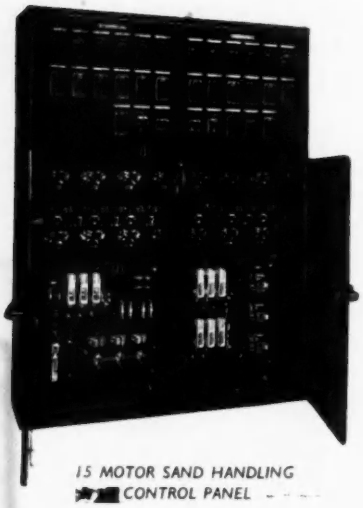

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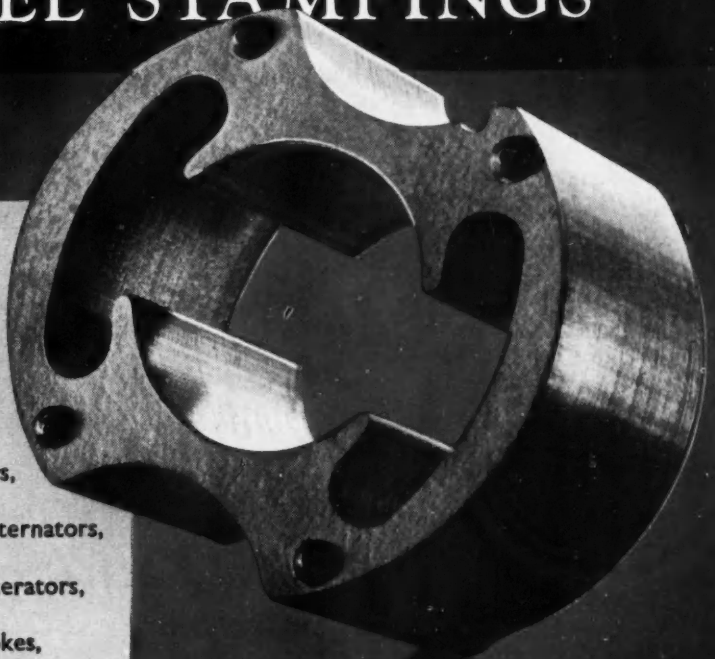

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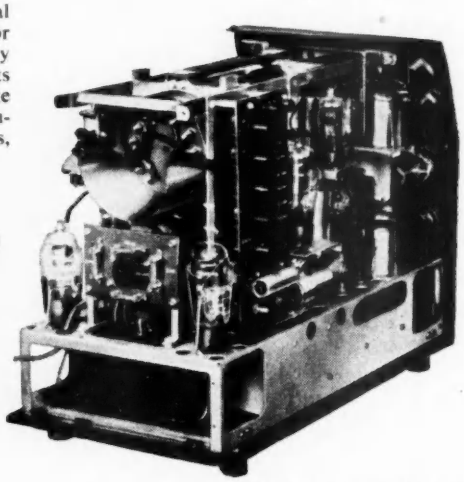

The photograph shows the chassis of a Cossor Double Beam Oscillograph

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ELECTRICAL TIMES

Vol. 120 No. 3130 THURSDAY, 1 NOVEMBER, 1951

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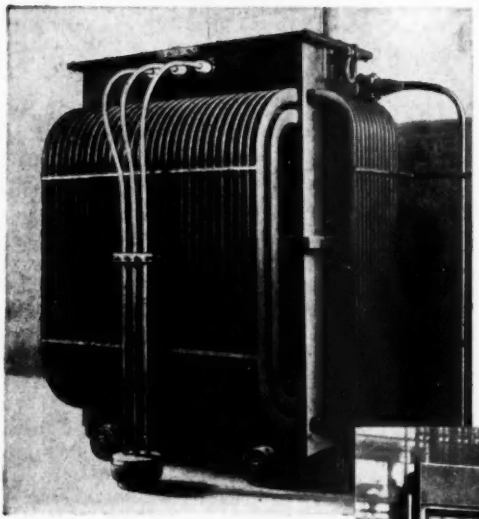

(ABOVE) One of two 1,000 kVA 11kV/400-230 volt Stepdown Transformers, at Frankley pumping Station Birmingham.

(OPPOSITE) A Mercury-arc rectifier providing a 300 amp. general load in a works Substation.

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Editorial

THE UNIONS' PART

THOSE with limited knowledge of trade union activities might be reasonably excused for thinking that nationalisation, a measure fostered by the T.U.C. itself, would bring a new and more broad-minded outlook into industrial relations within those industries. Indeed that was a view held by many trade unionists themselves. Consequently it has come as something of a shock to find that in many respects relationships have deteriorated rather than improved, strikes have increased rather than diminished. The changed circumstances of union representation consequent upon nationalisation are reviewed in the "Future of the Union," another of the Acton Society Trust research papers, a series which has been previously commented on in these notes. On this occasion Meteor is perhaps less competent to comment, but the recent London Board electricians strike is indicative that all is far from well in the trade union movement and reveals the uncompromising rivalry that exists between unions. At the time of nationalisation we all felt that here was an unrivalled opportunity for trade unions to reveal their ability to take a wider part in the make-up of the industry to the ultimate good of all. New problems arose which demanded a degree of industrial statesmanship which seems to have been pitifully lacking and the report reveals that some trade unions are not even aware of the existence of some of these new problems. Meteor can do no more than hope that this report will be studied by all interested in the trade union movement.

LOAD CUTS ON THE AIR

THOSE unfamiliar with the several factors responsible for the shortage of generating plant must have found informative the documentary account given by the B.B.C. last Friday and entitled "Focus on Power Cuts." The meet was at Battersea power station and the cause of load cuts was hunted through national and regional control rooms, on to Lord Citrine's office and finally went to ground at B.E.A.M.A. under the protection of Col. B. H. Leeson with Sir Robert Gould and Sir Norman Kipping acting as whippers-in. Then, as we were still in the cubbing season, the chase was taken up again on coal where the quarry eventually became lost behind a a lack of coal waggons. It was all very well done, with that over-simplification which leaves the listener thinking he knows all the answers because of the successful dramatisation of one of them. The cue for this apologia for load cuts was the introduction by the B.B.C. of its new peak warning system. Listeners were told of why the Light Programme had been selected and of the special announcer standing by the teleprinter directly connected to national control ready to give the warning without delay. Unquestionably these warnings will prove a great asset at times of peak load, and both the B.E.A. and the B.B.C. deserve congratulation on the successful conclusion of the negotiations which have been proceeding for some considerable time.

CONSULTANTS IN MASS

ANY reader who was prompted by last weeks' jubilee article to glance through some of the early issues of this journal may well have been struck by the vigour that then marked discussions held at meetings of the Institution of Electrical Engineers. Perhaps some idea of those early days was in the mind of MR. A. H. YOUNG, chairman of the Institution's Utilisation Section, when last week he concluded his inaugural address by suggesting that Institution meetings should be given the opportunity of discussing new problems facing industry in the electrical field, rather than remain confined as at present to the appraisal of suc-

cessful solution of old ones. The chance to advocate new methods of carrying through projects, which he suggests, would certainly liven up meetings in London and throughout the country, but it would entail some possible sacrifice by industrial organisations which would have to reveal their difficulties. It is hardly likely that the resulting meetings would produce a detailed answer to the questions posed, but the interplay of many minds working on specific engineering possibilities would most likely indicate which were the profitable lines of approach. Meteor hopes that Mr. Young will have the opportunity of putting his idea to the test of an experiment: the meeting should be well worth reporting, if the present members of our Institution are as willing to risk their reputation as were their predecessors.

IDEAS FROM EUROPE

RURAL electrification is an ever-present problem for the supply industry in this country, and fresh ideas on how to overcome the difficulties it presents should be very welcome. It is with this background that news of the possibility that a general study of rural electrification may be undertaken by the Committee on Electric Power of the Economic Commission for Europe, is of importance. Though the intended co-operative investigation is designed primarily to bring the experience of the more densely populated countries of Europe to the aid of those having an essentially agrarian economy, there is much in the scheme that recommends it to British engineers. Amongst matters of importance to our capital-restricted electricity boards are the question of tariff forms and their relationship to agricultural economics, and the relative fields of application of large generating stations and of small self-contained systems powered by diesels, or wind, or hydro plant. This country has much information to offer on these matters, but the ready interchange of opinion which the Committee workings of the Economic Commission for Europe encourage is likely to offer in return novel ideas on a problem whose satisfactory solution would be a major victory for our industry.

RAMMING IT HOME

ALTHOUGH it is now nearly eighteen months since Mr. S. L. M. Barlow addressed the 1950 E.C.A. Conference on new techniques for installation work, many of the suggestions made seem to have gone unheeded. This is particularly so with his reference to the setting of pins, studs, and the like, into concrete by firing them in with a small controlled explosive charge. In the U.S. this method is so firmly established that it is estimated that studs, pins and other fixings are being fired into concrete and steel at the rate of 2,500,000 per month, with savings in time up to half an hour per fastening, and costs which may be as little as one-sixth of the cost of conventional methods. The gun stems indirectly from the humane cattle killer developed in Britain at the turn of the century—it seems that it has much to recommend it. Against it are only the fact that it is an imported article, and a vague prejudice regarding safety and possible shattering of concrete—both of which are stated by those who have seen it in operation to be negligible risks.

SOLUTE SURDITY

WHEN are new words wanted and when are they not? A recent abstract of a research report in a journal of eminence states that:

> ". . . it is found that such mixtures . . . are more readily ignited than the most readily ignited mixture of coal gas with air, but are less readily ignited than the most readily ignited mixture of hydrogen with air."

Surely, if "inflammable" or "explosive" would not exactly fill the bill, a new word such as fireable or ignible would at least make the report sound less like a legal document. That research workers have no objection to coining—or lopping—words is shown by the use in a later report of "sorption" and "desorption," the latter being strongly reminiscent of the infamous "debussing" which was one of the minor horrors engendered by the war. But even if desorption is the opposite of absorption, why "sorption" itself? It seems solutely horrent—if not actually an ortion.

Meteor

Connections for Small Motors

Identification of winding leads is comprehensively discussed in this practical article for the maintenance man

By KARL WILKINSON

MOST motor repairers seldom have difficulty in identifying unmarked leads emerging from small motors. The general maintenance man, however, responsible for many types of equipment, may have had neither the time nor the opportunity to become familiar with the wide variety of connections of normal motors, quite apart from the unusual machine that will occur from time to time. Both the repairer and the maintenance man may have trouble with this last type, especially if no information can be gleaned from the name plate. These are often missing or have been replaced with a seller's label bearing a name only.

Experience is often essential in order to connect these unusual machines; not necessarily experience of that particular type, but experience to help find or discard certain windings. The complications are many. Basically we can have the split phase, resistance start, resistance run, capacitor start, capacitor run, dual voltage, dual speed, and the many varieties of the repulsion motor.

Let us first examine a few of the simpler types of motor windings which will act as a guide to the more complicated machines, and commence with two warnings: Do not assume that the starting winding has the higher resistance. In some very small stators the running winding is higher; secondly, in the power factor test on each winding with a locked rotor, the reading for the starting winding, although generally higher than that of the main winding, may be too close for accurate determination. In certain makes of motor the two readings will be equal.

Generally speaking the running (main) winding occupies more space than the starting (auxiliary) winding. In many motors this may be obvious on inspection, in others an element of doubt may exist and some machines have the R and S windings identical, both in the space occupied and in the number of turns and the gauge of wire used. Although the starting windings are usually displaced 90° (electrical) this is not always the case, exceptions being found in shaded pole and certain makes of single phase motors where the poles are 60° (mechanical) apart instead of 90° for a four-pole motor.

Split Phase Motor

Consider the simplest normal split phase motor, with no external or internal starting resistance and no centrifugal or other automatic switch, i.e. a motor where the phase displacement in the starting winding is due to its own inherent resistance. Here we usually have a running winding occupying about three-quarters of the depth of the slot and a small starting winding superimposed. (It should be noted that in a small split phase motor the S winding is nearly always nearest the rotor, while in larger machines, over one h.p., it is invariably at the bottom of the slot, thereby allowing the main winding to be nearer the rotor in the latter case.)

Normally four leads emerge from this type of motor, but even if the leads are coloured it will afford little assistance owing to the lack of uniformity in this country of colour codes.

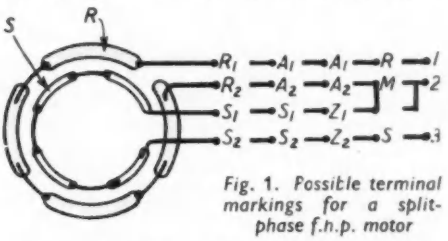


Fig. 1. Possible terminal markings for a split-phase f.h.p. motor

They may go to terminals marked as in Fig. 1.

Frequently the main leads R or A are larger than the auxiliary ones S or Z and for this type of motor the resistance of the S circuit is always higher than that of the R. It is usually possible to trace these leads by opening the motor and inspecting. If this cannot be done because the

leads are buried in the windings or bound in with cotton tape or twine binding, so concealing their origin, the leads can be traced by pricking the windings with a needle and ringing through with a bell set or series lamp. Occasionally only three leads are found emerging from these windings. The motor is then of fixed rotation, as one end of the S winding is permanently joined to one end of the R; that is A_2 and Z_1 are common. Therefore ringing through will not locate any particular lead, but the two circuits can be determined by their ohmic value.

Starting Resistances

Some split phase motors have a starting resistance housed in the end plate, either on top of the windings or behind the coils. These resistances are usually non-inductive annular rings taped all over and connected in series with the starting winding. Hence the S circuit can be located either by inspection or ringing through. On some small fan motors these resistances are permanently in circuit, but this arrangement is becoming obsolete. Some fan motors with this type of winding can, incidentally, be converted to capacitor run machines by replacing the internal resistance with an external capacitor. The capacitance required is found by trial and error to obtain good starting performance and keeping the amperes per square inch in the S winding to about 3,000.

Larger split phase motors with these non-inductive resistances have the starting winding taken out of circuit when the motor is up to speed, either by a centrifugal switch or by manual control. One make of electric lawn mower furnishes a good example of this type of motor. Markings, if existing, are similar to those shown in Fig. 1.

Basket Windings

The preceding motors were assumed to have concentric windings, as in Fig. 2. This is the normal practice in nearly all small motors. As they become larger the tendency is towards a

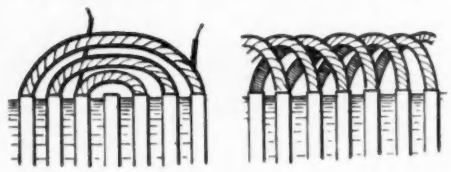


Fig. 2, on the left, shows the concentric winding, used for most small motors, while Fig. 3, right, illustrates the basket or distributed type. In both cases the view is as seen from inside the stator

Fig. 4, on the left, and Fig. 5 show diagrammatic end views of basket windings that have different numbers of coils/pole

basket or distributed winding, Fig. 3, similar to a three-phase stator. Indeed it is not possible to tell at a glance whether such a motor is single or three phase. With the concentric type, the starting winding can frequently be found easily by inspection, whereas in the basket method visual indication may be nil, especially if each coil is individually taped or the winding is taped all over. As the comparative resistance may not furnish the information required other means of testing must be adopted.

The stub joints between each coil or coil group can be examined and if this shows that two sizes of wire were used the finer one will probably belong to the starting circuit. Beware, however, of parallel connected coils or coils wound "two in hand," i.e. wound with two wires in parallel. This can be very misleading when for example the running winding is 2/·020 in. and the starting winding 1/·020 in. If all coils are found to have the same gauge wire, or the difference is too small to be seen, there will probably be more coils per pole for the R than the S winding.

Tracing Poles

Should the coils be gang wound, i.e. two or three coils wound without cutting the wire, it may be very difficult to trace and locate any circuits at all, so another method must be adopted. If current is fed into a circuit, i.e. one pair of unmarked leads, the poles can be traced with a steel feeler, a compass or a test coil. Of these three methods the compass, although so often used, can at times give very misleading and erratic results owing to the ease with which it can alter polarity in a strong field. The steel feeler, a very simple tool, will give a rough and ready indication of the polar positions but the best method is to use a test coil. This is merely a small solenoid with an iron core. If the winding, fed by d.c., is explored with this coil it will locate and, to a certain extent, indicate the magnitude of each pole formed by the circuit under test. It will be realised, of course, that current will only flow through the search

coil when the d.c. circuit is interrupted and moreover the "make" will indicate a different polarity from the "break." Consequently a methodical test is imperative, the test coil being connected to a galvanometer. If, however, the same coil is used connected to an a.c. voltmeter and the windings are fed with a.c., the voltmeter will record the volts induced in the test coil as it passes over each pole. These two checks provide an accurate, if rather tedious, identification of the poles formed by each circuit.

Fig. 6. A single layer basket winding is shown diagrammatically on the left, and a double layer winding in the right hand sketch

The drawing Fig. 4 shows diagrammatically a common arrangement in a single-phase basket wind. It will be seen that with 12 coils, one circuit has four poles with one coil per pole (starting winding) and the other circuit with four poles and 2 coils per pole (running winding). Fig. 5 shows a similar arrangement but the S winding has alternatively one and two coils per pole.

By way of further explanation it should be noted that there are two types of basket windings. The single layer and the two-layer wind. In the first case each coil side fills a slot and does not share it with any other coil. In the second case, for a two-layer wind, each coil shares a slot with another coil from an adjacent pole, Fig. 6. It will be appreciated that in the two-layer basket wind it is more difficult to trace the running and starting circuits because there are twice the number of coils, giving the stator a very full appearance. It is, moreover, possible to have two tiers of basket windings, quite independent of one another, giving, say, a six-pole winding in one tier and a four-pole winding in the other, each tier having its own R and S circuits. Such a motor would have eight leads going to the junction box.

Shaded Pole Motors

Wound shaded pole motors are very common in certain makes of small exhaust fans. There are usually two or three turns of heavy wire, e.g. ·064 in. per pole, and the ends are joined together. That is to say, the main leads only emerge from the motor. This is very simple and does not warrant further explanation. There is, however, one make of motor where this starting winding is also brought out to the terminal box giving four leads, two large and two small. Contrary to general practice the smaller leads are the R circuit, and the two heavy leads are momentarily shorted together to start the motor by a special starting switch and are not connected to the mains.

Capacitor Motors

We can now pass on to the very common capacitor motor, either cap. start, cap. start and run, or permanent capacitor. Consider the popular capacitor start refrigerator motor. There are two main types of these: the normal and the swing connected. Reference to Fig. 7 will show that with (a) and a 200 V supply we have a fine wire used for the starting windings which can usually be traced quite easily by inspection and ringing. Also as the capacitor is in series with the S winding it must be rated to operate intermittently on 200 V. Four leads usually emerge from such a motor. In the swing connection only three leads go to the junction box. Fig. 7 (b) shows one end of the starting winding connected to the middle point of the running winding so reducing the voltage in the starting winding to half the line volts. Consequently the capacitor, again in series with the S circuit, is only rated for 100 V. In addition the capacitance required is quite different for the two types of motor. Approximate values are shown in the illustration.

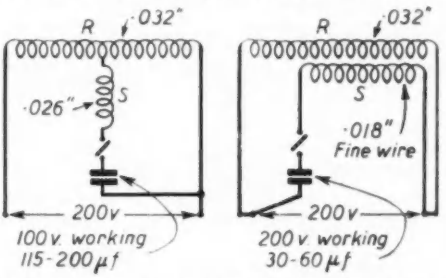


Fig. 7. Connections for two types of capacitor motors are shown here, normal (a) on the right, and swing connected (b) on the left

Care should be taken in replacing these capacitors. Many of them are not marked for capacitance and if the required value is not known and the type of motor in doubt the windings should be examined to discover whether the connection is normal or swing.

Locating Leads

It was mentioned above that little difficulty will be found in locating the S leads in the normal motor (a). In (b), however, it can be much more complicated especially as it is a

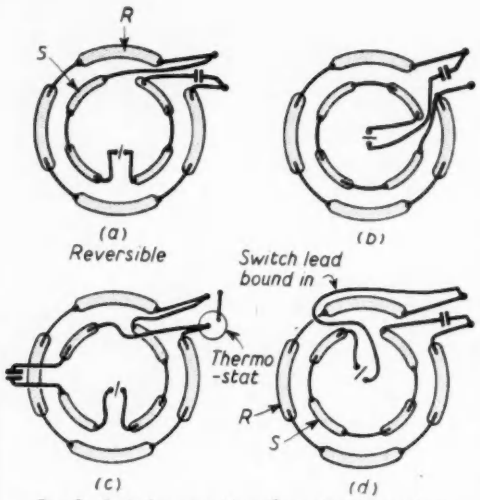


Fig. 8. Switch connections for capacitor motors

common practice to wind either the R or S, or even both, "two in hand," i.e. two wires in parallel. This may lead the repairer into thinking he is dealing with a coil of fine wire. To check this the stub joints between the coils can be examined. If wound two in hand there will be four wires at a joint. In this connection it should be noted that in certain very small capacitor motors a fine wire may be doubled back by the winder to make it stronger at the stub joint, thus indicating, apparently, a two in hand wind. For these very small motors the size of wire used can, for the R circuit at least, be determined by calculation, given the amps or h.p. of the motor, allowing about 3,000 A per square inch. If this works out to the size, roughly, of the wire used in the motor, two of these wires emerging from a coil means that the ends have been doubled back.

Another help in determining the R and S windings is to follow the leads from the switch plate, one of which must necessarily connect to the starting circuit. Fig. 8 may help in this matter.

In Fig. 8a, a common method, the capacitor is connected externally to the winding at the junction box. In 8b, a non-reversible connection, only three leads emerge *and must not be confused with a swing connected motor. The size of the starting wire will check this.* Fig. 8c shows the running winding fitted with a thermostatic switch in a non-reversible motor, and in 8d a loose "switch" lead is taped into the winding but has no connection with it. In the swing connected motor, Fig. 9, the star joint between the end of the S winding and the middle of the running is often visible and is frequently left projecting slightly by the winder. Quite a number of motors have an electrical, as opposed to a centrifugal, method of closing momentarily the S circuit. Fig. 10 shows this circuit diagramatically. Here again the S winding can be located.

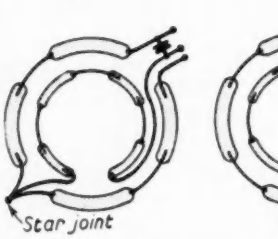


Fig. 9, on the left, shows the swing connection in practice, while Fig. 10, right, shows diagrammatically the circuit used when an electrical method of switching the start winding is used

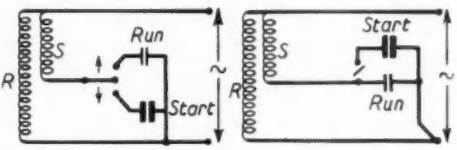


Fig. 11. Switch connections for capacitor start and run motors are seen in these two circuits

Capacity Start and Run

Capacitor start and run motors are not usually swing connected, so the remarks applying to the normal capacitor start will also apply to this type. Fig. 11 (a) shows a circuit using a transfer switch with an extra contact and Fig. 11 (b) an ordinary switch used for this connection.

Other Stators

The windings to be described in this section are frequently used in certain makes of exhaust fans and also in other motors well beyond our range of "small" machines.

Fig. 12 gives an idea of the general appearance of a winding which can be very confusing to anyone not acquainted with it, especially when the leads are broken off or the leads go to a junction box with the connecting jumpers missing.

This winding is for 3,000 synchronous r.p.m. (at 50 c/s), in spite of the fact that there are six coils, compared with four or eight in the preceding examples. Each coil may have the

same number of turns and the same gauge of wire, and each pair of coils probably connected in series when wound. As a result it is not possible to determine immediately which are the running windings. Indeed, as the coils are all similar both in size and relative position the question resolves itself into choosing a R or S winding and not in locating them.

Fig. 13 shows the connection of this type of motor. Any pair of diametrically opposite coils could be used as the S winding but it is usual to select the inner pair. A two-pole motor has been illustrated with the running winding shown shaded.

A similar arrangement is shown in Fig. 14 (a) for a four-pole motor with six coils, but here we have three coils inside and three on the outer layer, and all may have the same number of turns and the same gauge of wire. As in the previous example any pair of diametrically opposite coils could be the starting windings. It will be seen that the polar axes are at 60° mechanical instead of 90° to obtain a four-pole motor. The schematic (swing connected) diagram is also shown in Fig. 14 (b). (This motor winding is very similar to a standard three-phase consequent pole machine, and if reconnected and fed with suitable voltage will obviously run on a three-phase circuit.)

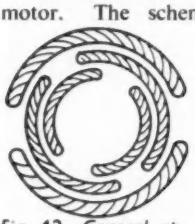


Fig. 12. General appearance of winding for 3,000 r.p.m. synchronous motor

A six-pole motor of a very similar kind is shown in Fig. 15a. There are nine coils, six of which are used for the running windings and three for the starters. As in the previous example, all coils are identical electrically. The connection is again swing as in the schematic diagram in Fig. 15b. Whereas in the preceding windings there were two or three distinct layers of coils, in this motor the coils are arranged as it were in a spiral. That is, we have a cross-over coil, marked X, that has one coil side in the inner layer and the other side in the outer. There is no special significance in this coil; it is necessary because of the relation of the number of stator slots and the poles required. It is quite common in many stators.

Types of Connection

In order to assist in tracing leads in a stator it is as well to recognise the two main types of coil connection: the long throw and the short throw. These two methods are shown in Fig. 16. In the short throw each adjacent pole is connected to give alternate polarities and

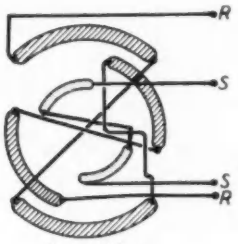
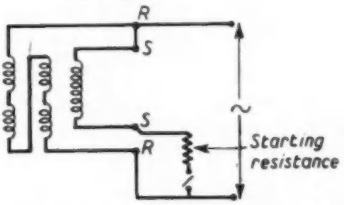


Fig. 13. These two diagrams show connections for the winding represented in Fig. 12



only requires a short jumper. In the long throw each alternate pole is connected to give the required, usually "like," polarity. Certain makers adhere rigidly to the long throw connection, and this at times can be very confusing. A good example of this added complexity is shown in Fig. 17. There are 12 coils each with the same turns and wire, arranged to give eight running coils in four poles and four starting coils. Normally each pair of coils for each pole would be connected in series.

A common method of arranging the windings of a motor for two voltages, i.e. 110/220, is shown in Fig. 18. One starting winding only is used but the running winding consists of two sections, of equal size and occupying the same number of slots. They are usually wound in two layers with insulation between each section. That is, one section occupies the bottom of the slots and the other the top. Alternatively, the two sections can be wound in the slots at one operation using two wires in hand. This must not be confused with a wind with two

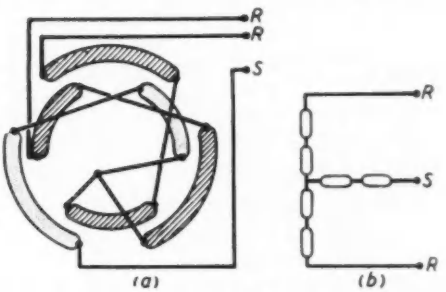


Fig. 14. Connections for four-pole, six-coil machine

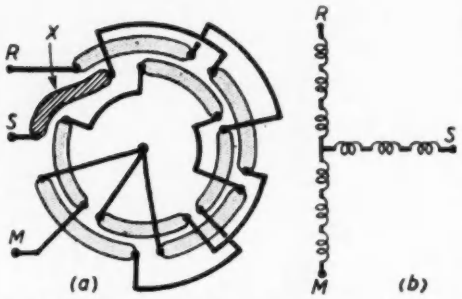


Fig. 15. Connections for six-pole, nine-coil motor machine

wires in parallel, mentioned above, but since we are dealing with a dual voltage motor, with, it is to be hoped, a maker's label affixed, the mistake will not arise. Whichever way they were wound the two sections are connected in series or parallel for the voltage change. The starting winding, which can be determined by the various means already described, is of one section only and is connected normal or swing for 110 V or 220 V respectively.

Repulsion and R.I. Motors

There are on the market a number of small electrically reversible repulsion or repulsion induction motors (not to be confused with repulsion start induction run motors). Although they do not come under the general type of motors dealt with in this article, since they have wound rotors, their windings can, nevertheless, be considered for our purpose as running and starting for the two circuits employed in the stators of these machines.

Ignoring the larger and more complicated compensated motors of which there is a wide variety, we have basically a stator very similar to that of a squirrel cage motor, i.e. a main winding (the inducing winding) and the starting (the field winding). Of these the inducing winding is the larger, that is to say it has a greater amount of copper, but both windings have the same gauge of wire. The identification of the two circuits presents little difficulty, but it should be remembered that in these motors the two circuits are connected in series and the rotation is altered by reversing the polarity of the field winding.

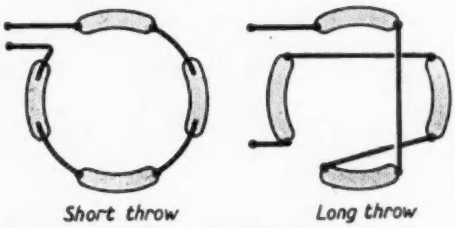


Fig. 16. Illustrating the difference between long throw and short throw coil connections

Inverted S.C. Motors

Although these motors are to a great extent obsolete in this country certain imported American machines still fit them. In them the cage forms the outer shell and is stationary,

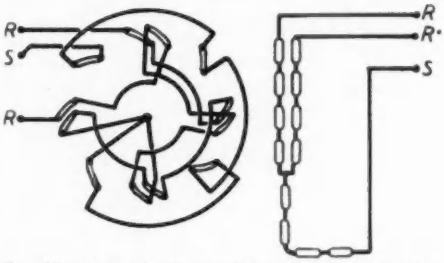


Fig. 17. Example of use of long throw connection

and the stator, with a normal coil disposition, revolves. Current is fed via radial slip rings which carry a centrifugal device to open the S windings. Location of the leads follows the preceding methods. The slip rings are fitted with three terminals on one side and one terminal diametrically opposite. One end of

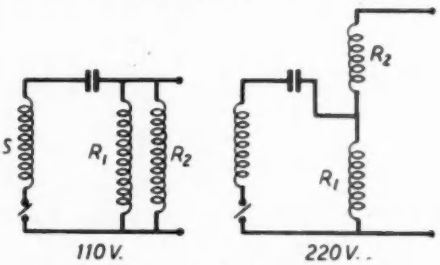


Fig. 18. Windings for double voltage motors

the S winding goes to the single terminal and the other end, with the two R leads, is connected to the three terminals.

Two-speed S.C. Motors

As an example of a small motor in this category we can consider a dental lathe. There are large numbers in use and their repair, if the machine is unknown, can be rather troublesome. They are mostly controlled by rotary switches with an unusual connecting diagram.

These motors operate at either 3,000 or 1,500 syn. r.p.m. and the speed change—apart

from switching arrangements—is effected by three different methods: (i) A separate start and run winding for each speed (four sets of

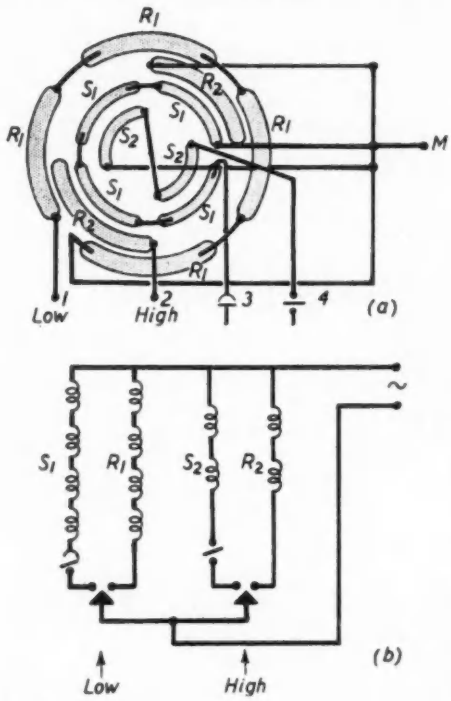


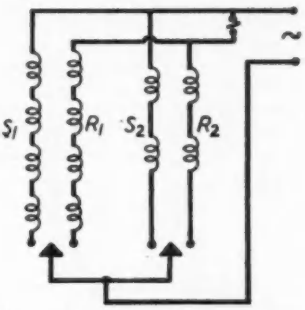
Fig. 19. Winding connections that are used with a dental lathe motor

windings with either one or two centrifugal switches); (ii) a main running winding and two starting windings (three sets of windings with one centrifugal switch); (iii) a main winding and one set of starting (two sets of windings with one switch).

In the first method, the coil layout is shown in Fig. 19 (a). When the motor is opened up, three layers of coils can be seen. The fourth layer, S_1 in Fig. 19, may not be immediately visible as it is often partly covered by the two coils S_2. Either five or eight leads emerge from the winding depending upon whether the joint M (Fig. 19 (a)) is made in the winding or externally.

Tracing the leads is not easy. In the first place they are often brought out via a small hole under the stator leading down into the foot casting housing the rotary switch. Secondly, the joints from the leads to the coils are frequently buried beneath or between the layers of windings. As a result visual examination will furnish scanty evidence but even one or two leads located will help considerably.

Fig. 20. Connections for two-speed motors using a single switch



The first step, if M is made externally, is to locate (in this example) the two running windings R_1 and R_2 by inspection or by ringing through. As these R windings are the two largest they can soon be found and the leads 1 and 2 marked respectively low and high speed R.

The S windings now have to be located in a similar way. The inner two coils marked S_2 can be easily traced but the four coils S_1 will want careful checking.

If the joint M is buried in the winding we have more trouble as the lead from the main feeds four circuits, two running and two starting. Three possible means of locating the windings suggest themselves. Firstly we can measure the ohms between M and 1, 2, 3, 4, respectively, the lower readings belonging to the two R circuits. Secondly, if a suitable current is passed through each winding local warmth will identify them. Thirdly, current

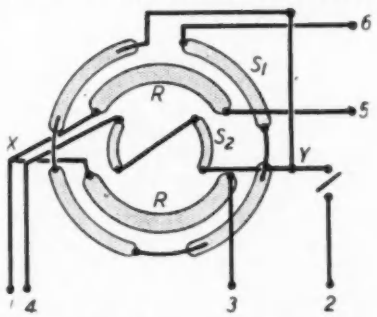


Fig. 21. Connections for a three-winding motor

passed through each circuit will give a magnetic pull at each pole. The number and position of these poles can be found with a feeler or by the other means mentioned above. A combination of these methods will locate the leads but it may be a rather confusing job. If, however, one or two leads have been previously

traced by inspection the problem is greatly simplified.

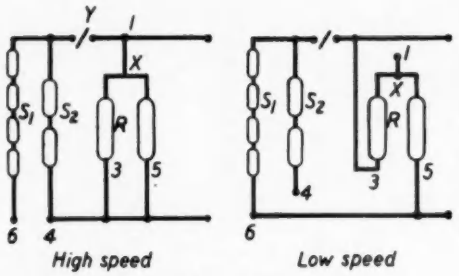


Fig. 22. Double speed motors with two separate sets of windings

In this example, as each winding is in itself connected in series, the polarity of the various poles is fixed and in the final connecting up for a trial run it will only be necessary to change over the ends of a S circuit to obtain the correct rotation for each speed. The schematic diagram is shown in Fig. 19 (b) with corresponding numbers.

In some models two centrifugal switches are used, one located in each end plate of the motor. Should there be only one switch gear the diagram will be as in Fig. 20, in which case the switch must operate at approximately 75% of the lower speed.

In all cases of multiple speeds any circuit not in use must be open-circuited by the switching.

Where three windings exist we have a different arrangement with two large coils (R), easily identified, and a two-pole and four-pole starting winding, Fig. 21. This is much easier to trace than the previous example as we have only two buried joints X and Y.

Speed variation is obtained by connecting the two main R coils in parallel to give opposite polarity (i.e. 3,000 r.p.m. syn. at 50 c/s) or in series to give a consequent pole connection with two like poles, i.e. 1,500 r.p.m. Each speed has its own starting winding with a common centrifugal gear at Y. Identification will follow previous methods bearing in mind, of course, the consequent connection. See Fig. 22.

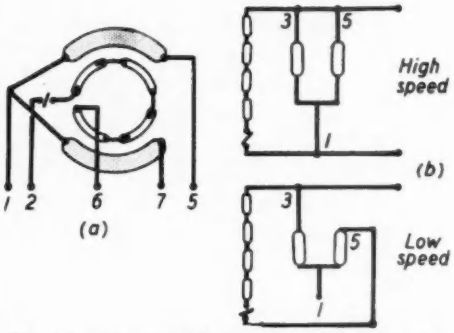


Fig. 23. Three winding motors for consequent pole speed variations

If there are two sets of windings a very simple arrangement exists and the leads can be traced as in an ordinary single phase motor, Fig. 23 (a). It is similar to method (ii) but uses only one set of starters. The schematic diagram is shown in Fig. 23 (b).

SUPPLY INDUSTRY SALARIES UP

INCREASES in salaries under the National Joint Board Schedule applicable to power station, sub-area, district, headquarters and division staff, have been announced. These follow the raise in pay to commercial and administrative staff in the Electricity Supply Industry, recently noted.

The new changes to the N.J.B. schedule have effect from July 1 last. Under these, the figures are increased by 10% on the first £450 of salary, plus 4% on the next £350 and an additional 2% on the balance. These apply to each of schedules "A," "C," and "D." As examples of the increase, a former salary of £775 p.a. is raised by £58 p.a., while a £520 salary is increased by £47 16s. p.a.

Exceptions to this latest adjustment in respect of schedule A, for power station, sub-area and district staffs, are the salaries for Class "F," grade 15, Class "G," grades 15 and 16, Class "H," grades 15 to 17, Class "J," grades 15 to 18, Class "K," grades 16 to 19, Class "L," grades 17 to 20, Class "M," grades 18 to 21, and Class "N," grades 19 to 22, all inclusive, for which the present figures remain unchanged.

Schedule A is also extended by additional grades with the following salaries:

Class "A," grade 11 £389; grade 12 £375
Class "B," grade 12 £389; grade 13 £375
Class "C," grade 13 £389; grade 14 £375
Class "D," grade 14 £389; grade 15 £375
Class "E," grade 15 £375.

Exceptions to the increase under Schedule C, for headquarters, division and area staffs, are the salary figures set opposite Grade 6 (headquarters) and Grade 9 (division and area), which remain unchanged. It has also been decided that junior engineers whose remuneration on July 1 last was in accordance with Grade 6 (headquarters) or Grade 9 (division and area) of Schedule C shall at that date be advanced by one year in the incremental progress.

Our readers' views ...

Psychology and the Control Room

THE article by Mr. W. H. Dunkley, in your issue for August 2, calls for some criticism and comment. First, I would have renamed the article "Psychology in Design of Control Systems," as it is clear that the designer is a pure technician working in some abstract manner on a job which, when completed and installed, will carry for years the result of his efforts whether they be good or bad.

Yes, most certainly call upon the men concerned who will be expected to use the system under review. (We would not, I am sure, expect a very good car which had been designed by a man who did not drive cars.) Thus, if the use or operation of various types of control systems had not formed any background to the design engineer's "pedigree," he must initially call for help and advice from those so suitably experienced as to offer sensible and valuable advice.

Approaching this point in a practical manner, we must go back to the specification as required by the customer, and it is at this point where the required advice should be sought. In the case of the B.E.A. and Sub-Area Boards, there should be no difficulty in deriving great assistance from their own staffs (more of this later), whilst in the case of, say, a new industrial installation, the sub-contractors would have to offer suggestions which their experiences show to be efficient.

However, a code of rules should be adopted which would form the foundations of all types and conditions of control systems likely to be encountered in the modern field of practice.

I will endeavour to enumerate these in their order of importance:—

1. *Communications.* Ample telephonic connections provided, with alternative systems as standby.

2. *Illumination.* High level of general illumination, with greater intensity over control desks (these may usually require local lighting).

3. *Noise level.* This to be as low as possible and warrants a separate building away from rotary and other machinery. Building of double windows may even be required to prevent ingress of noise associated with large industrial plant.

4. *Heating and ventilation.* This question is of great importance and differs in every case. The ideal to be aimed for is, of course, silence in operation and quick response.

5. *Decoration.* Pastel shades in light colour are to be preferred to prevent drabness, but where control panels themselves are finished in a particular shade, walls and ceilings should be in a contrasting colour, but still light.

Control Array. Whatever scheme is adopted, whether it be direct control, supervisory control or the new mimic diagram, standardisation is called for. The red and green lamp for "closed" and "open" indication respectively, seems to be an accepted standard, and is quite sound in that respect. But how many systems change the layout so that at one station it is green on the left, red on the right, and at the next vice versa, whilst yet a third has the green uppermost with the red beneath, or the reverse.

Surely it is only commonsense that gives one green on the left and red on the right, which, I think, is favourite. Also, for transformer tap-change push-buttons for remote operation, what is more sensible than Left for Lower and Right for Raise. But what is so important, make the display standard on any one comprehensive system, so that engineers working between two stations are less confused.

For audible warnings a low-toned buzzer is the ideal medium, as a strident clanging bell is a perfect menace (as is the klaxon). A cut-out on the control desk for the audible device is a sheer necessity, and a check or testing button should be provided so that the audible device may be tested as required.

For visible warning the flashing lamp is the obvious answer, and I think we can thank the supervisory systems for the adoption of this on mimic diagrams, or even direct control.

Meters. Is it really desirable to provide a voltmeter on every feeder panel? Ammeters are essential, but a large number of voltmeters could be dispensed with. I would suggest a voltmeter for each section of busbar and a common voltmeter, operated through a selector switch or even synchronising plug, for the feeders.

Labelling. The provision of useful labels is more desirable than, say, correct labels. By this I mean that it is often quite unnecessary to fit a full label which can only be read from a short distance. It is much better to label a generator or transformer control panel as G.1, T.1, or G."A" or T."A," as the case may

be, than to write GENERATOR or TRANSFORMER in full. Also, in the case of a large transforming station, incoming supplies from large bulk supply transformers should have different coloured labels to those on outgoing distribution transformers. This will assist in removing possibility of incorrect operation on two more or less adjacent control panels which are so much alike in appearance.

Reverting to Mr. Dunkley's article, one would imagine that the Control Engineer or operator (horrible word this) had no other duties to perform than to sit and watch the instruments. This is just as much a fallacy as the opinion of the general public that control engineers are "load shedders." This constitutes just one of the very many important functions performed by these "backroom boys."

Finally, in my reference to the assistance that could be provided by control staffs, I do implore design and constructional chiefs of staffs to pass on any information of future connections and installations to the system as soon as they are to hand, so that ample time is available for preparation of operational plans by the control staff.

S. C. Patrick

HARROW

Ireland v Leeds

WITH reference to your article "60 Years of Trams" in the issue of October 25, I would like to point out that when I was a small boy I frequently travelled on the Giants' Causeway Tramway which was only recently dismantled. This was an overhead trolley wire tramway and was claimed to be the first in operation in the British Isles, and if my memory serves me right was opened in the year 1888 which is three years earlier than the inauguration of the system in Leeds to which you refer.

"Tramway Driver"

EDINBURGH

Educating The Engineer

IN his Chairman's address to the North Midland Centre of the I.E.E., Dr. E. C. WALTON, B.Sc. Eng., Ph.D., M.I.E.E. chose to review the work of technical colleges in the field of electrical engineering, and began by analysing the widely varying types of student with which teachers in such establishments have to deal. As a measure of numbers, he noted that there were 160 colleges offering courses for O.N.C. in electrical engineering in England and Wales, 12 in Scotland and 8 in Northern Ireland.

Part-time day release of junior employees for attendance at technical colleges had increased during the last twenty years, and had many advantages for the teacher. As a personal point, Dr. Walton strongly deprecated any attempt to utilise the increased time available in part-time day and evening courses for the purposes of reducing the duration of a course: it should rather be used for a fuller treatment of syllabuses and for additional laboratory work.

Concentrated Attendance

Part-time day release usually involved the student in attendance for one whole day or two half days per week and also for one or two evenings per week. In some cases, however, it might be better to arrange for the full-time attendance to be concentrated in one or two periods totalling about 10 weeks in the year. Apprentices in the electrical contracting industry were a case in point. In respect of part-time courses, the Chairman referred to the absence of a recognised national qualification for craft apprentices engaged as electrical fitters in the supply industry and in the assembly and maintenance of electrical plant. Attempts of such men to follow the O.N.C. course usually resulted in their failure to advance beyond the first or second year.

For many specialised course subjects the City and Guilds of London Institute acted as an examining body, and in some cases its awards also indicated practical training and successful completion of a technical college course. Degree courses, especially for the London External degree, were offered by many colleges and polytechnics, and there had recently been an expansion in higher technological courses of a specialised nature. Lecturers for these courses are of necessity drawn largely from industry.

Finally, in his address, Dr. Walton summarised recent official proposals for higher technological education. In his opinion, the satisfactory development of courses suggested in this field would depend very largely on the provision of a generous scale of financial assistance.

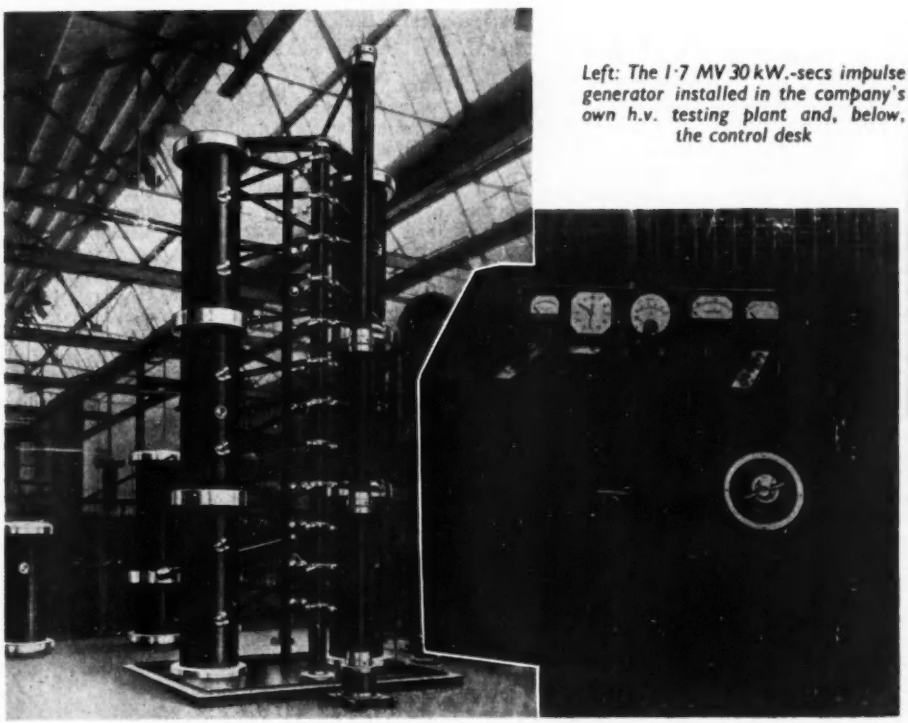
Impulse Testing for Production

New Plant designed and built by Johnson and Phillips, Ltd.

THE growing emphasis being placed on the need for impulse testing of high-voltage equipment has led many manufacturers to install Marx type impulse generators for this purpose. One of the latest installations of this equipment is that at the Johnson and Phillips' works at Charlton. It is believed that this is unique as, with the exception of a few "bought-out" items, it was designed and built entirely in the user's works.

The installation has an output of 30 kW-secs at 1·7 MV and consists of a 200-kV d.c. charging unit; a twelve-stage, two-column generator; a capacitor-screened resistance potential divider; a high-speed sealed-glass-tube, double-beam cathode-ray oscillograph with recording camera, and a control desk. For uniformity of appearance, the transformer, the rectifier and the generator capacitors are housed in 23 in. diameter black Bakelised paper tanks, fitted with cast aluminium end rings and corona shields.

For charging the generator a 200 kV, 6·6 kVA transformer, a 250 kV peak half wave rectifier and a limiting resistor are used. The 230 volt supply is fed through a regulator to the transformer which operates with its core at 100 kV at full voltage. Rectification is performed by a copper oxide rectifier mounted on an insulating base so that positive or negative d.c. may be obtained by connecting the transformer output to the bottom or top of the rectifier unit, the opposite end of which is connected to the generator, via a limiting resistor which can pass a maximum current of 30 mA at full voltage.



Left: The 1·7 MV 30 kW.-secs impulse generator installed in the company's own h.v. testing plant and, below, the control desk

Twelve stages are used in the generator, and each stage includes a 0·255 microfarad condenser which can be charged to a maximum voltage of 142 kV.

The capacitors are discharged by twelve pairs of ten centimetre spheres fitted on two vertical Bakelite cylinders situated between the capacitor columns. One cylinder is fixed and the other may be rotated about its vertical axis by a lever arm and screw mechanism driven by a small electric motor located under the base cover plate of the generator, thus altering the sphere gap distance. A slide wire potentiometer gives an indication of the sphere gap length. Sets of resistors in each stage control the output wave form. It is interesting to note that the overall height of the generator is only 18 ft, representing a figure of 10·6 ft per MV.

Recording

Recording is carried out on a sealed glass tube type c.r.o. working at 20 kV accelerating voltage and incorporating two beams for the simultaneous recording of voltage and current. Sweep speeds from 0·3 to 1,000 microsecs are available together with timing "pips" covering a range of time intervals from 0·1 to 100 microsecs. A 35-mm recording camera is used in conjunction with the oscilloscope to obtain permanent records of all tests carried out.

Control is exercised from a remote-control desk which houses the voltage regulator, the push-button switches and associated contactors for energising the 200-kV charging transformer, and the push-button switches for adjustment of the generator sphere gaps. Indication is given of the voltage and current input to the charging transformer, the gap setting and the mean stage voltage. The last-named is derived from a micro-ammeter connected through a 3,000-megohm resistor to the high voltage side of the first-stage capacitor.

The potential divider is of the simple resistance type surrounded by a tube of cylindrical capacitors which screen the resistors and at the same time put a small load on the generator, thus reducing the effect on the output waveform of variations in the test load.

Testing, using this impulse generator, will be carried out on cables, transformers, switchgear, sealing ends, etc., although at the moment due to the difficulty of obtaining building licences for a h.v. test house with the appropriate clearances, the upper voltage is limited to about 0·9 MV. This is because the equipment is temporarily located in the transformer shop where flashover at higher voltage takes place to the roof girders.

Distribution in Factories

ELECTRICAL distribution equipment for use in factories and, in particular, the high rupturing capacity cartridge fuse, was considered by MR. E. JACKS, A.M.I.E.E., in a paper presented this month to the Manchester Association of Engineers. He began by emphasising that from the point of view of those on installation service, its job is to provide an adequate source of electricity wherever it is required. To ensure fulfilment of this, it is worthwhile planning all but the smallest jobs on paper, and analysing the design to ensure that the minimum amount of copper is used while keeping voltage drop and thermal loss within accepted limits.

The next point to be watched is that all possible faults can be safely withstood and interrupted. So far as overcurrents are concerned, normally the only position where special protection is required is in the control gear adjacent to motors. Elsewhere the provision of ammeters in appropriate positions where they can easily be seen by the maintenance staff is usually sufficient to prevent overloads. For short-circuit protection the h.r.c. fuse is the most widely used device; fuse-switches may be used in many positions where such protection is required.

Mr. Jacks went on to discuss the soundness and accessibility of equipment, its appearance and layout, care of extension, and safety. He then turned to the properties of h.r.c. cartridge fuses, saying that these are available for interrupting potential short circuit currents of up to 35 MVA three-phase. They have the advantage of interrupting the short circuit current before its maximum value is reached, and, with modern designs, of preserving their characteristics throughout their useful lives. Methods of manufacture are adopted which ensure that operation within $\pm$ 5% of published calibration curves is obtained. This last fact is of considerable importance, because of its effect on discrimination between fuses of different ratings. The extra care needed in laying out an installation network to take full advantage of these characteristics is well worth while.

Choice of Equipment

Space factors nowadays play an important part in determining which kind of distribution gear shall be used. Further, since most distribution equipment is at present being installed in existing factories, adaptability and care of extension have enhanced importance.

In the final section of his paper, Mr. Jacks reviewed the choice of equipment for use in the special conditions imposed by various industries. He selected for special consideration general engineering, steel, chemicals and textiles.

Notes on Wiring by MEGOHM

INSTALLATION ECONOMY

Materials shortages must be met by new methods

PUBLICATION of the difficulties now occurring in the U.S.A. and the proposed restriction on the use of materials for installation work there is, I believe, a pointer to the difficulties we shall have to face during the next few years.

The steel position if anything is now worse than it was some six months ago. It is practically impossible to purchase today sheets, angles or flats at mill or stockists' prices, although in certain cases, I am told, angles cut to lengths can be purchased at fabrication rates.

Control of steel supplies for the contracting industry will come into force in December this year and whether this will produce the necessary steel quickly for contractors' use remains to be seen. The whole position appears to be difficult and it seems more use should be made of: (1) Systems for installation work which do not require large quantities of materials in short supply, and (2) To cut out extravagance in installation design.

On the first point, there must be many large buildings, such as workshops, bus stations, aircraft sheds, power stations, etc., which are about to be erected now or in the near future for which plans have been drawn up to wire these buildings with either v.r.i. cables in conduit, m.i.c.s. cables or v.r.i.s.w.a. cables, which will obviously involve the use of some tons of steel and copper and a very large labour force.

Catenary Systems

There is little doubt that considerable saving in the use of steel, copper and lead can be effected by using a catenary distribution wiring system for much of this class of work, although in certain sections of these buildings it may be essential to use one or other of the wiring systems using steel conduit, lead or copper cased cables. A catenary system is available and has been successfully used on several installations, including the wiring on the Bailey Bridge spanning the Thames from the Embankment to the South Bank Exhibition site. This system has also been used overseas and I would commend to the attention of the senior engineer of the Ministries and the British Electricity Authority the possibilities of using this system more extensively.

There were great opportunities for using catenary wiring systems on the South Bank Festival site and for the lighting on the Embankment. Many engineers must have noted the waste of materials in short supply and I give for example the method used for supplies to the decorative lighting features overhanging the pavement on the Embankment which were served by a series of conduits carrying v.r.i. cables running in the angle of the parapet wall and pavement. These services could surely have been installed in half the time by employing an overhead distribution system between the lighting standards.

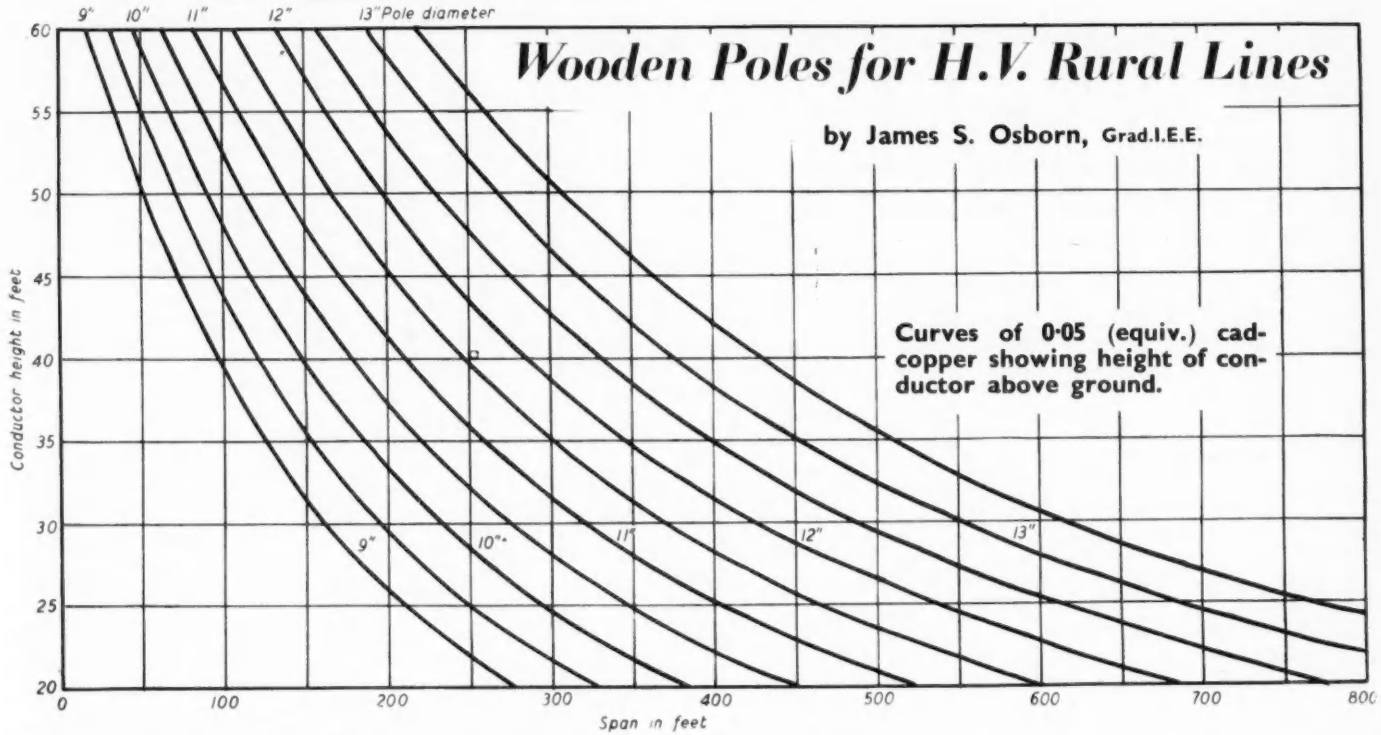
Simple Switching

On the second point, saving in installation design can be principally effected by simple circuit and switching arrangements. Much circuit wiring may be saved by avoiding a zig zag arrangement of connecting alternative lighting points on different rows on the same circuit and/or controlled by the same switch. The reasons generally advocated for this policy is that half lighting is available when required. Most of us know in practice half lighting is generally never used and I suggest it is a fallacy to say people once used to good lighting will accept half lighting.

The connection of lighting points to separate phases of the supply system where there is more than one lighting point in a room is another method which can use up a lot of material and labour. At first one would imagine that this is done to overcome the stroboscopic effect when using fluorescent lamps, but this was not so in a particular case recently brought to my attention. The reason given for carrying on the wiring in this manner was that in the event of one phase failing, lighting would be available from the other two phases of the supply system. This appears to be a little extravagance which we could forego, especially when a secondary lighting installation is installed, as was the case in this particular building.

Wooden Poles for H.V. Rural Lines

by James S. Osborn, Grad.I.E.E.

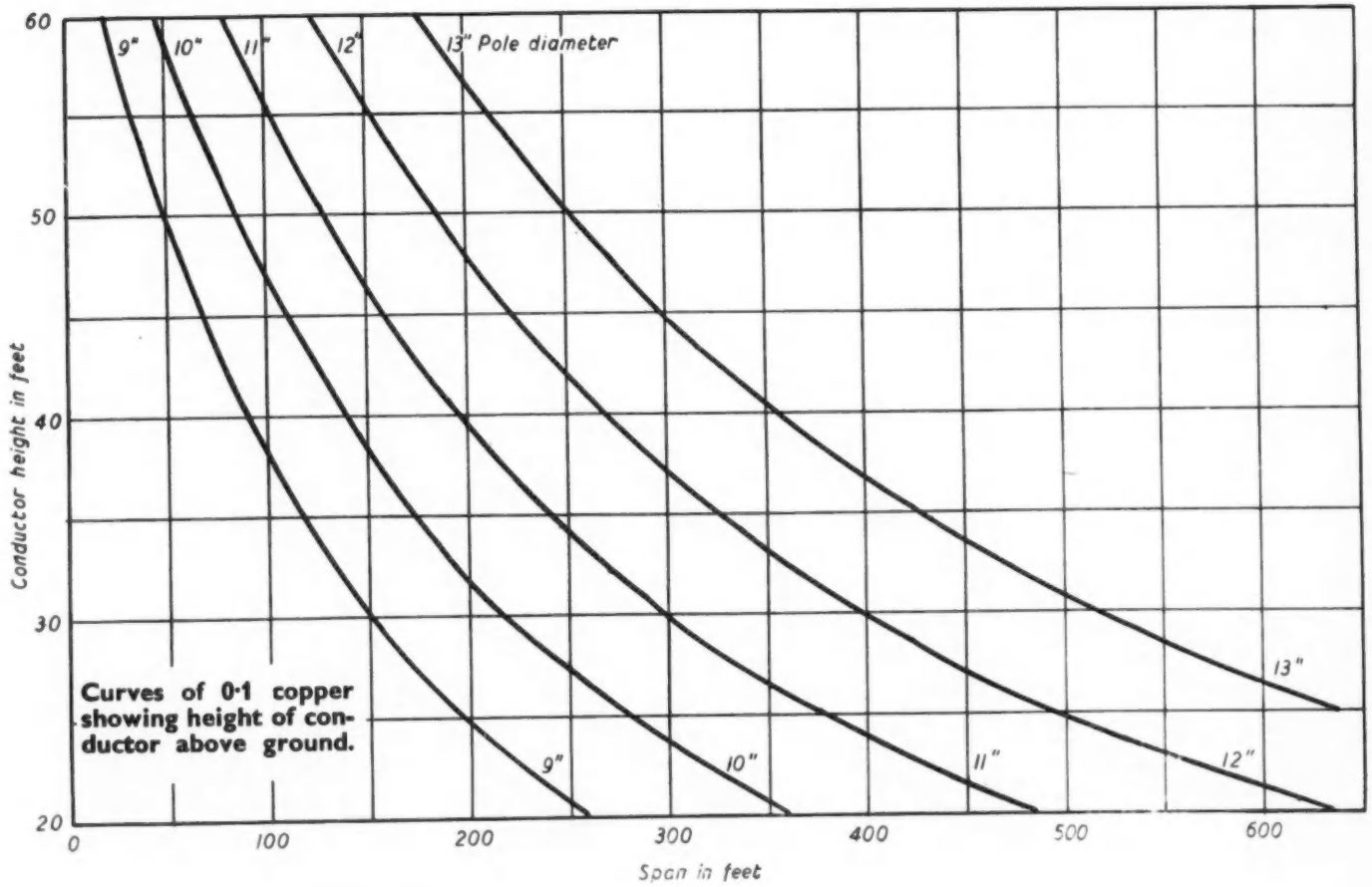


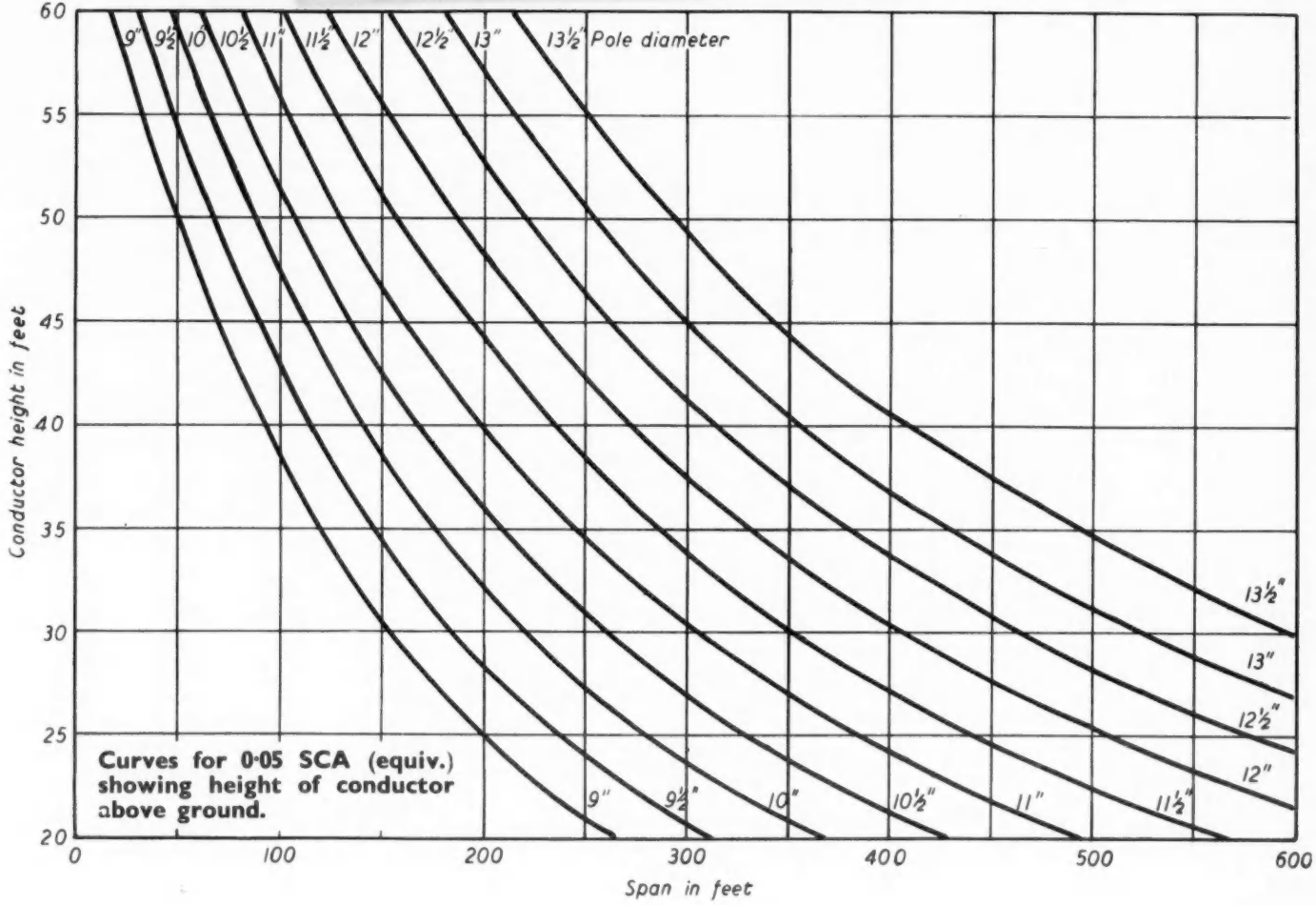
In the interests of economy it is desirable to work out pole diameters individually rather than by taking a few specimen spans and heights and fitting these by rule of thumb methods to other conditions. If many poles are to be used, each requiring many calculations, the chance of a few slips are great and not easily noticed. On the scale given, these curves are sufficiently accurate to enable lines to be constructed with their use and they have the advantage that slips in calculation are avoided.

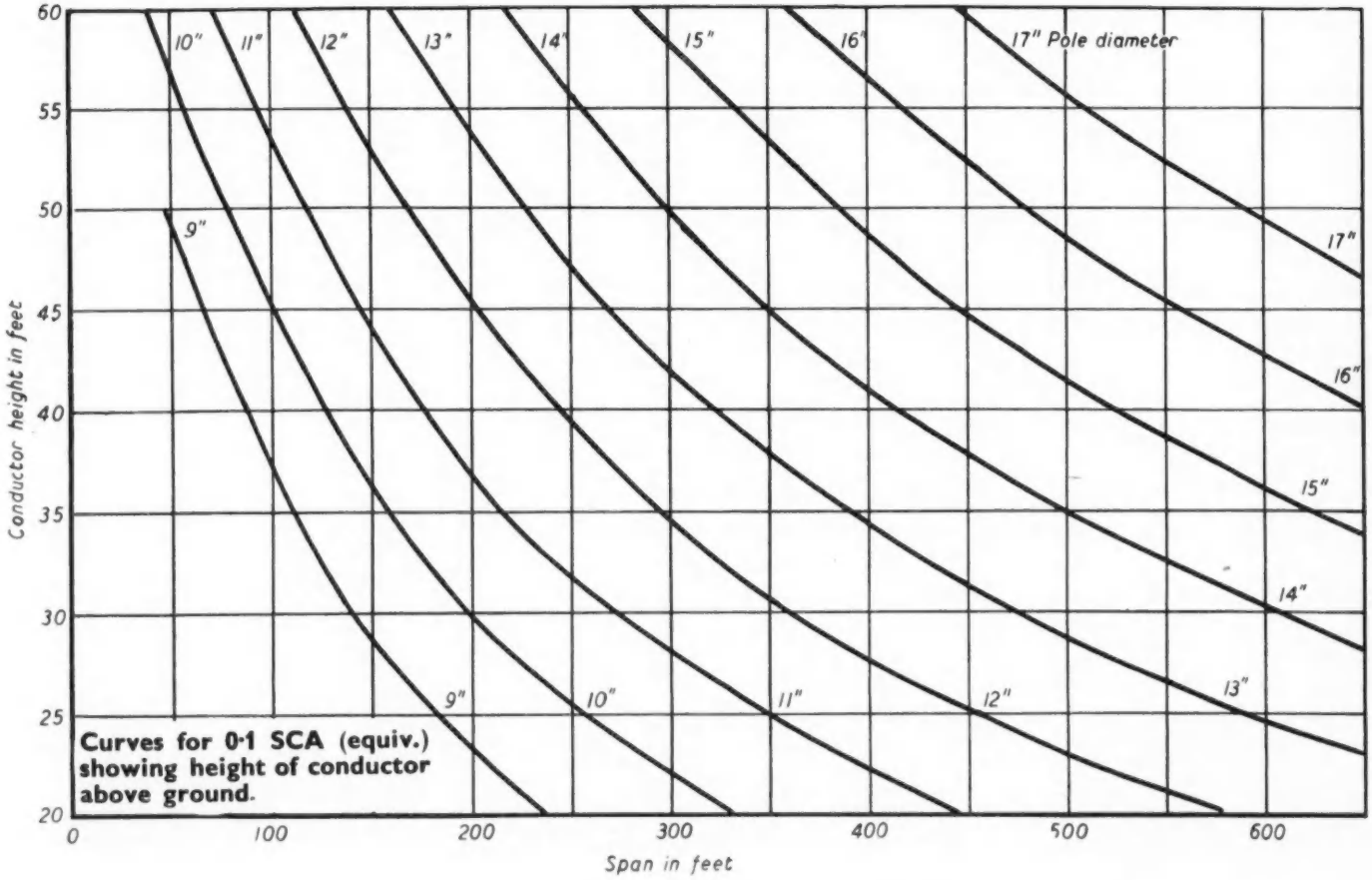
These curves are based on B.S.S. 1320 and have the necessary factor of safety and pole windage allowed for in the calculation. The conductor height shown in feet is the height of the centre of wind pressure which is at the conductor for flat construction and a third of the conductor spacing above the bottom conductor for triangular construction.

The curves are for flat 3-phase lines having no fourth wire.

Similar curves can be drawn for A pole lines taking into account the greater strength of these poles.


60
50
40
30
20
0
100
200
300
400
500
600
Conductor height in feet
Span in feet
9"
10"
11"
12"
13" Pole diameter
13"
12"
11"
10"
9"
Curves of 0·1 copper showing height of conductor above ground.


Conductor height in feet
60
55
50
45
40
35
30
25
20
0
100
200
300
400
500
600
Span in feet
9" 9½" 10" 10½" 11" 11½" 12" 12½" 13" 13½" Pole diameter
13½"
13"
12½"
12"
11½"
11"
10½"
10"
9½"
9"
Curves for 0·05 SCA (equiv.) showing height of conductor above ground.


Conductor height in feet
60
55
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35
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25
20
0
100
200
300
400
500
600
Span in feet
10"
11"
12"
13"
14"
15"
16"
17" Pole diameter
9"
17"
16"
15"
14"
13"
12"
11"
10"
9"
Curves for 0·1 SCA (equiv.) showing height of conductor above ground.

I.E.E. Utilisation Section Address

—Problems that Face the Industry

Mr. A. H. Young

SOME of the present problems facing the electrical industry were reviewed at the I.E.E. last Thursday by Mr. A. H. YOUNG, M.I.E.E., (Edmundsons Electric Co. Ltd.) in his inaugural address as Chairman of the Utilisation Section. After reviewing briefly the fuel situation, he went on to consider in some detail the peak load problem, saying that we could not afford to continue having load shedding, and that resources had to be found to supply sufficient energy to meet the country's demands as an industrial nation.

Much had been said about the effect of the domestic load on the peak, but it had to be remembered that the high diversity of this load helped considerably in achieving the existing load factor of about 46%. Industry, with a 44 hour week, had a load factor of only 20 to 25%. It was possible that a campaign could be usefully begun to educate users along these lines, in the hopes of persuading industry to spread its demand.

The supply industry had been developed by a low-price-per-unit policy, and this had to be continued if a high load factor were to be maintained. With this in mind the full use of generating units installed in industrial premises should be considered, and the possibility of combined schemes for the supply of steam and electricity to factory estates should receive close attention. An example of the possibilities here was given by the Treforest estate in South Wales.

With the need to ensure attractive prices for exported goods, cost of electric power to the consumer had to be watched. If industry could not obtain much needed electricity to increase its productivity from the public electricity supply sources, then it appeared that as a short term policy there was a good case for the installation by industrialists of high speed diesel generating sets, operated in parallel with the public supply during peak load periods. It was unlikely that, even if they had diesel sets installed, manufacturers would fail to use energy from the public mains.

As a means of load spreading, the invention of a means of storing electricity in a light weight accumulator, which could be charged if necessary at a high rate, seemed overdue. There was also ample scope for further work based on the recent development of liquids which could be used as heating media for high temperature operation up to 600° F without pressure. They might offer a partial solution to the storage of electrical energy in the form of heat during periods of low demand.

Economy

Remarkable advances in the thermal efficiency of generating plant had been made in recent years, but the resultant savings were frequently dissipated after the electricity left the power station. In 1949, the energy lost in distribution amounted to 5,211 million kWh, or 13% of the total sales to consumers; equivalent to 412 kWh/consumer.

An example of the relatively heavy losses that might be incurred relates to transformers. For a 5 kVA size, the iron loss was about 72 W, with a resultant energy loss per annum of 630 kWh; for the 25 kVA, the equivalent figures were 180 W and 1,580 kWh. Savings in losses might be effected in several ways, and too often insufficient attention was paid to these possibilities. Such saving could be of special importance when rural supplies were considered. Since many rural dwellers did not use much more than 630 kWh/year, for every unit used, two might have to be supplied to the transformer.

In his conclusion, Mr. Young suggested that the modern tendency to large industrial concerns tended to develop a large number of specialists, but comparatively few men with a wide range of practical experience. The Institution could be of some service here by providing a place where electrical engineers could meet to exchange views and discuss freely problems in their particular field. There would be an improvement if leading industrialists and others would tell members frankly about some of their problems, thus giving members an opportunity of assisting in finding some solution.

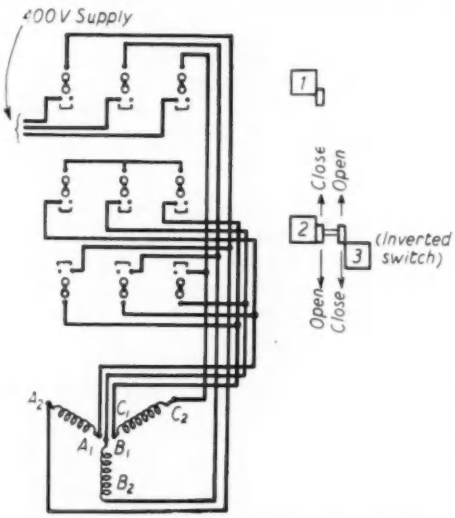
Problems and Practice

IN ENGINEERING

Starter Trouble

COMPLAINTS had come in to me several times that the c.w.p. motor (3-phase, 3 h.p.) of a 75 kW Paxman's diesel set was running too hot. I was informed that it was thought that rewinding the motor would have cured the trouble but hopes had been shattered as the motor continued to run excessively hot to the extent that the windings were smoking.

I went to see what the trouble was and found that the cause of the overheating (as I had thought) was not due to bearing trouble but to the method of connecting the motor to the supply. Two d.p. switches were used as the starting switch. Nothing serious was wrong about this. I discovered, however, that the motor should be star-delta started but instead it had been connected to run as a star wound



Connections for star/delta starting using three triple pole switches as a temporary measure

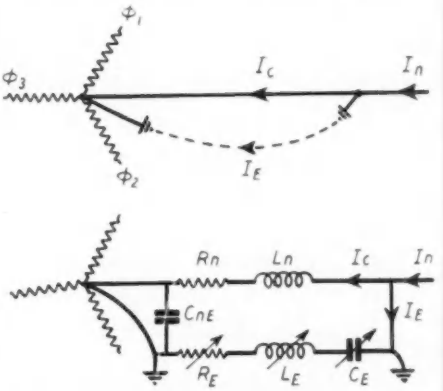
motor. Previously, the motor had been connected for delta starting. Both methods did not stop the overheating of the windings and as such the c.w.p. was never used for more than a few minutes at a time.

As no star-delta switch was available anywhere I had to employ three t.p. switches which I connected up as per sketch. The motor ran for 12 hours and was as cool as cucumber, and the pump is back in commission.—*E. H. Yonren, Engineer and Manager, Zaria, Nigeria.*

Earthing and Radio Interference

I HAVE always found that whenever an earth fault has developed on an underground cable, consumers on that feeder invariably claim that radio interference has been due to the incipient fault.

Now here is an interesting point. On one occasion several consumers complained of varying and intermittent interference. All the complainants were fed from the same sub-



Current paths and circuit parameters relating to the note on interference

station. The cause of the trouble was found in the substation. The star point of the transformer was earthed externally to the tank. The phase and neutral leads were cambric insulated, lead sheathed single-core cables and the neutral was brought out to a bar which picked up the feeder neutrals. This bar was also earthed and this multiple earthing was immediately suspected.

Reference to the sketch shows that there is a path through the copper conductor to the star point and another through the earth and that any out of balance in the neutral will split along these parallel paths.

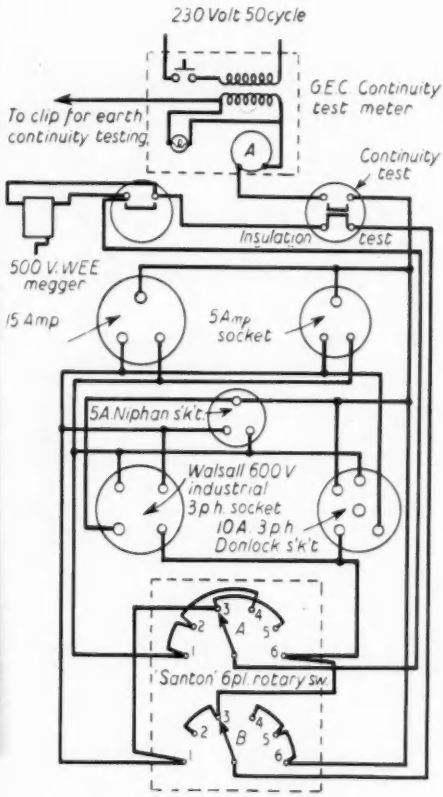
Thus the conditions of an earth-fault were established i.e., return of current to the star-point via the earth path.

It is well known that the path between two

earth electrodes acts as a non-linear impedence, and I think that roughly the two paths between the star-point can be as shown. If this is the case it follows that there is a circuit which will under certain conditions inject a high-frequency signal into the system and so cause interference.—*Eric Fairbrother.*

Tool Testing

THE accompanying diagram shows a test rig for portable apparatus which has been developed to check the trailing cables of portable plant. Experience has shown that with this combined continuity and insulation arrangement much time is saved as the cable can have a complete test on all cores from the plug to the switch merely by plugging into the correct socket, clipping the continuity test lead on to the case of the switch, and operating the two-way switch for the test required.



Test rig for portable apparatus

Code of Rotary Switch Positions

Switch Posn.	Test	
	3 ph	1 ph
A1 B1	Red-Blue	Line-Neutral
A2 B2	Red-White	
A3 B3	Blue-White	
A4 B4	Red-Earth	Line-Earth
A5 B5	Blue-Earth	Neutral-Earth
A6 B6	White-Earth	

The one-way switch is merely to check the "Megger" connections by shorting the "Megger" leads. Of course, the sockets fitted on the panel would be those in use in the works concerned and can cover 3-phase and 1-phase plugs of any make.—*Algee.*

Coal Receiving Hoppers

IN one installation repeated trouble was experienced due to the disintegration of the lower portions of the coal receiving hoppers which were of reinforced-concrete construction. This perishing of the concrete was due to contact of wet coal and to overcome this trouble the hopper outlets were suitably broken back and arranged for taking special cast-iron mouthpieces. Coal will generally contain a certain amount of pyrites and moisture so that it is necessary to take precautions in concrete work against acid action. In many cases the choice of material and the form of construction adopted for these hopper mouthpieces should ensure resistance to corrosion, easy replacement or quick repairs.
—*M.I.C.E.*

Stray Earths Again

A FAULT I was sent to investigate serves (to me at least) to illustrate that the least expected can happen to anyone. Some secondary wiring in No. 1 high voltage o.c.b. was being tested, the o.c.b. being out for maintenance, but one of four feeding into, and out of, a common bus-bar. It was during the tests that No. 3 o.c.b. tripped. The cause was not so mystifying as may at first have been thought. After ensuring that the o.c.b. had not opened on fault, and discovering that a short to earth of the positive lead of the 20 V trip supply in No. 1 o.c.b. cabinet had been accidentally and momentarily made, tests were carried out. It was found that a stud in the relay of No. 3 o.c.b. was down to earth, and it was this stud that provided the necessary path to carry tripping current to the trip coil. The stud contacted the negative terminal of the relay, and so the trip coil and auxiliary switch of No. 3 o.c.b. were effectively energised.—*H. G. Knight.*

Mr. R. Davis

I.E.E. Supply Section Address

—*High Voltage Research*

IT was natural that this year's chairman of the I.E.E. Supply Section, MR. R. DAVIS, M.SC., M.I.E.E.(N.P.L.) should have his inaugural address on high voltage research, and he began with a brief consideration of the function of such work, and went on to consider the necessary tools and techniques. The h.v. transformer came first, and he considered that here the air insulated type was becoming obsolete. The capacitor, the most valuable tool in h.v. power frequency measurements, is used in three types, with air at atmospheric pressure, and compressed gas, and paper in oil as the respective dielectrics. Parallel plate or uniform field electrode capacitors with air dielectric are available for voltages of the order 1,000 kV, whilst compressed gas capacitors, which have many attractive features, are at present only available for voltages up to 500 kV.

Accuracy in h.v. measurements is dependent on a chain of comparisons going back to the standard cell. For direct h.v. absolute measurements, Kelvin's attracted-disc electrometer is admirably suited. The U.S. Bureau of Standards has constructed an atmospheric air model with a maximum field strength of about 5 kV/cm. At the N.P.L. a project is well advanced for an instrument using compressed nitrogen, with an anticipated working stress of 100 kV/cm. Elsewhere a vacuum construction with a similar maximum stress is being undertaken.

Surge generators are now well-established pieces of laboratory equipment. Because of the high buildings required to accommodate generators for 2,000 kV or above, voltage delivered per unit height is an important factor in the total cost of installation. A great simplification in surge testing technique which has been achieved in the last few years has been the introduction of modern c.r.o. tubes and lenses permitting single sweep recordings with a duration of a fraction of a micro-second. Selected tubes can give a performance in every way comparable with that obtained from the continuously pumped h.v. oscillograph. Voltage dividers are usually associated with surge generators when quantitative measurements have to be made, and agreement in amplitude to better than 2% is readily obtained with resistor, capacitor and resistor-capacitor dividers. Distortion may, however, occur in the first microsecond or so of the wave front, and this can seriously affect the amplitude recorded when breakdown takes place here. Research into this problem is now proceeding.

With the possibility of h.v. d.c. transmission in mind, the N.P.L. is planning a half wave metal rectifier to give a 1,000 kV d.c. supply with an output of 30 mA. This generator is itself experimental in design.

Dielectric Breakdown

Recent researches have shown that the intrinsic electric strength of many materials is higher than had been supposed. There are many obstacles in the way of full utilisation of this electric strength to provide h.v. equipment of small bulk: only in cables is the field distribution nearly ideal and a single dielectric employed. To attack this problem in transformers, the N.P.L. is investigating the surge breakdown of liquid and solid dielectrics in series.

Electric strength measurements on gases are of importance to the engineer, and the corona discharge is a special aspect of gas discharges which attracts special interest. This is on account both of its effect on energy losses in overhead lines and the attenuation it produces in travelling waves on overhead lines. Investigations on current flow and energy loss have been made using point-sphere electrode systems, which allow the current to be measured but make field strength calculation difficult, and with concentric cylinders, which give a radial field but have the corona current masked by the capacitance current.

Equipment

Cables employing impregnated paper dielectric have been confirmed as having a surge electric strength of 1,000 kV/cm, this value being between 5 and 10% higher with positive polarity surges than with negative. Polar-

ity reversals in surges have little effect on the cable proper, but in joints where there is a longitudinal component of electric stress, some reduction in strength may take place. Dielectric strength in the direction of the paper laminae is only one-fiftieth of that radially, so that design to reduce the longitudinal component of stress is important.

Polythene, with an intrinsic electric strength about 3½ times that of paper, and its low power factor, has been considered for use in power frequency cables, but it is doubtful whether polythene cables can be operated at as high stresses as pressure cables, and give long life.

Surge tests of transformers are being increasingly applied, but there are some important questions of technique and interpretation still outstanding. A general superiority over power factor tests as a method of indicating shortcomings in design and manufacture is, however, becoming generally accepted.

One problem with the tests is the difficulty in detecting the failure of minor insulation (i.e., of that between turns and coils of the winding.) Chopped wave tests, which apply the most severe stresses, obscure any sign of breakdown on the oscillogram of the test. Various methods are available for overcoming this difficulty, but a final answer to which is best may have to await the outcome of theoretical studies of the transient response of transformer windings, now proceeding. It is noteworthy that in spite of these uncertainties some users have sufficient confidence in the method to call for surge tests on transformers immediately prior to their installation on site.

HIGH DEFINITION FILMS

New Electronic Process May Revolutionise Film Making

RECENT developments in television have led to the possibility of producing an image on a cathode ray tube of such high definition that it may be photographed on to celluloid and give a final image as good as, if not better than that produced by using the ordinary optical cine-camera.

To exploit this development in film studios, where it has many advantages, a company, High Definition Films Ltd., has been formed. The directors of this company, which is a joint enterprise between the J. Arthur Rank Organisation, British Lion and Messrs. Pye Ltd., are Norman Collins, ex-Controller, B.B.C. Television, who is Chairman and Managing Director; Viscount Duncannon; Mr. T. C. Macnamara, late head of B.B.C. Technical Design and Installation and at present Technical Director of Scophony Baird; Mr. A. D. Peters; Sir Robert Renwick, Bart., K.B.E., and Mr. C. O. Stanley, C.B.E., Chairman, Pye Radio.

Although much detail work has yet to be carried out, the basic principles are fairly straightforward. The existing film camera is to be replaced by a specially designed electronic camera which will be able to use all the existing optical systems available for cine cameras. The output from one or more electronic cameras will then be monitored and controlled and the final selected picture photographed. In this manner the director will be able to see at all times what the cameras are actually taking, and errors can be corrected at the time by retakes instead of remaining undetected until the following day as happens with the conventional camera where the film has to be developed, printed and shown as "rushes."

It might be thought at first sight that the interposition of an electronic system between the optical system and the film must inevitably lead to loss of clarity and definition. This however is not so. The system will work on a 700 to 1,000 line basis with an extremely small spot on the screen of a specially designed high-voltage high-intensity cathode ray tube. This will give a definition somewhat better than the grain size on conventional film stock. Secondly, the electronic link introduces the potentialities of variable gain, which will allow much higher light intensities to be available for the photographic process, and thus permit the use of slower speed, finer grain film, and, finally, the electronic camera is far more sensitive than its film counterpart for low illumination levels.

When these advantages are considered in conjunction with the monitoring facilities and such easily controlled processes as cuts, fades, mixes, wipes, "opticals," etc., it can be seen that the electronic system is far more flexible and economic. It is hoped that the existing rate of two minutes of finished film/day may easily be increased to ten.

Industrial Ultrasonic Testing

Dunlop-G.E.C. Equipment localises Faults in Tyres

IN 1943, owing to the scarcity of rubber, it became necessary to find a non-destructive method for determining whether the internal structure of aircraft tyres had been damaged by landing stresses and were therefore unfit for retreading.

A method was consequently developed using ultrasonic waves which, when passed through the tyre wall, would be reflected by any discontinuity such as an air film. In order to provide a transmitting medium, the ultrasonic generator, the tyre and the receiving heads were placed in water.

This subsequently has been developed and is now in a form suitable for production testing. The first of the new instruments has been installed at Fort Dunlop and can cover a wide range of covers from 14 to 24 in. in rim diameter, 4½ to 17 in. width and up to 300 lb in weight. Faults having an area of ⅜ in. by ⅜ in. or more can be detected.

Description of Equipment

As can be seen from the schematic diagram, the fundamental principle is comparatively simple. The transmitting crystal is placed below the surface of the water within the cover, and the sound is picked up by six receiving heads located across the tread of the tyre. These are switched on together, and any discrepancy between the meter readings noted.

The tyre itself is lifted and placed into the tank by a pneumatically operated handling gear; in the tank it rests on two rollers, which are mounted above the water level, and these are used to revolve the tyre at speeds up to 10 r.p.m. during tests and are driven by a ⅛ h.p. motor through reduction gears. The speed range enables the tyre to be rapidly rotated at the beginning of the test for wetting purposes, to be run through fairly fast for testing and, if necessary, to drop to "slow" or "stop" for precise location of a flaw.

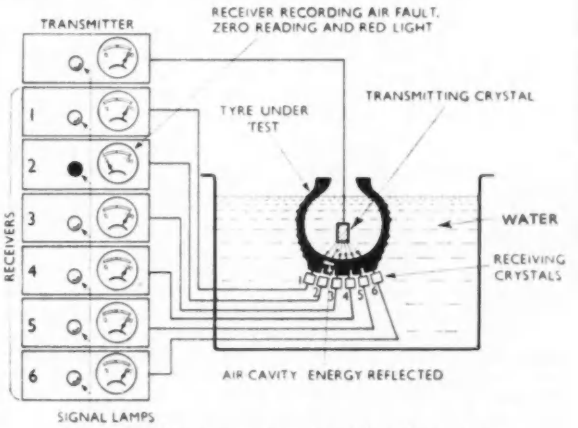
Ultrasonic Generator

The transmitter head houses a ⅝ in. dia quartz crystal mounted in a brass holder placed 1 in. from the rubber in the well of the tyre. The ultrasonic beam is radiated at an angle of 120°. Leads are taken from each of the receiving crystals to separate amplifiers, and these provide both visual indication on meters and operate red-light alarm signals.

A frequency of 50 kc/s has been chosen, with an output of about 1 watt. This has been selected because, as the frequency increases, the angle of the radiation diminishes until at about 1,000 kc/s it becomes virtually a parallel beam with a dia. equal to that of the crystal. Further, the absorption of rubber increases rapidly with frequency and sets a practical industrial limit of about 500 kc/s. The instrument is designed to use a frequency of about one-tenth of this figure, and thus gives a wide angle of radiation so that a single transmitter can serve six receiving crystals. It also has the advantage that reasonable signals may be obtained without the use of elaborate high-gain amplifiers.

In operation, the ultrasonic generator is set to give a meter indication of about 80% full-scale deflection on each receiver indicator. After wetting the tyre, speed is set at 6 r.p.m. for large tyres and lower for the smaller sizes. Each revolution of tyre results in a 90° arc of cross section being scanned, and means are provided for rocking the transmitter and receiver crystals about an axis.

The ultrasonic generator is provided in duplicate, together with a spare amplifier and panel so that servicing may be carried out without interfering with production.



Schematic diagram to show principles of operation

overseas news

Standard Regulations

Standardisation of electricity regulations throughout Australia was advocated by Mr. Brand, State Minister for Electricity, giving the opening address at the annual conference of the Electrical Contractors' Association of Australia at Perth last month. There were too many laws and regulations made separately in each State for electricity, and there should be a way of reconciling these differences and having standard laws throughout Australia, he stressed. He appealed for the employment of more apprentices because there was a great demand for electricity ahead and there would be a greater call on tradesmen. Items on the agenda included a fair-trading policy.

Cost of Restrictions

The State Electricity Commission of Victoria was spending more than £50,000 a year in enforcing its power restrictions, it was revealed by the deputy Premier, Mr. Dodgshun, last month. A total of 75 officers are employed by the Commission on this work, of whom 13 were engaged on "field investigations" and court proceedings. The remainder were employed on arranging consumers' quotas and answering inquiries. Their salaries ranged from £5 5s. to £20 15s. a week, the average being £13 a week.

Avoiding Restriction

The threatened curtailment of rural electrification in Victoria this financial year will be avoided if a new self-help finance scheme of the State Electricity Commission succeeds. The Commission is to invite groups of prospective consumers to advance about half of the capital cost of extending the supply line to serve them. The money would be treated as an advance against the cost of electricity used by the consumers during the next five years. Any balance remaining to a consumer's credit at the end of that period would be refunded. In announcing this scheme, Mr. R. A. Hunt, chairman, said it would enable the Commission to keep faith with more than 180 country towns waiting for a supply.

Steam Stations for Ontario

Ontario's new major steam generating station, the Richard L. Hearn power station on the Toronto waterfront, was formally inaugurated by Premier Frost last Friday. At present there is only one 100,000 kW power unit installed but three others are on order, the station being originally planned to accommodate six such sets. But Mr. R. H. Saunders, chairman of the Hydro-Electric Power Commission of Ontario stated recently that he hoped it would not be necessary to expand operation to the fifth and sixth units: it depended on whether or not St. Lawrence power became available. At the Toronto station the second unit is scheduled to be in service this month, with a third by November 1952 and the fourth by March 1953. Another steam power station of the Commission —the J. Clark Keith generating station—is also due to come into operation this month.

Plant for N. Sweden

A new power plant at Pengforsen on the Ume River in North Sweden is to be built by the Skanska Cementgjuteriet at a cost of Kr. 20,000,000 (£1,380,000). Machinery and other equipment for this station, which is owned by the Sydkraft Group, will cost another Kr. 20,000,000.

Austria's Plight

Low rainfall this autumn, together with increased industrial consumption means that Austria will be critically short of electricity during the coming winter, we learn. The country's hydro-electric output this month has, so far, averaged 6 million kWh daily, compared with the 9 million kWh average of last month. Thermal power stations have had to resume operation, causing a premature drain on coal stocks. But Yugoslavia has offered to supply 50,000 tons of coal for Austria's power stations.

Hirakud Scheme

Two organisations are to be set up by the Indian Government to reduce chances of delay and promote efficiency in execution of the Hirakud Dam project in Orissa. One is to be known as the Control Board and will be under the chairmanship of the Chief Minister of Orissa. The other, a committee, will enquire into the sufficiency and suitability of arrangements connected with the engineering, financial and accounting aspects of the project. Initial investigations for the Hirakud project were carried out in 1946. It comprises the construction of a dam across the Mahanadi River; gravity and lift canals for irrigation and two hydro-electric installations—one with six units of 37,500 kW each and the other with four 24,000 kW sets. Originally estimated to cost Rs.478 million, a sum of Rs.109 million had been spent on the scheme up to the end of July last.

Scientific Teaching

Reference to the help the National Institute of Sciences of India had received from an industrial concern was made by Mr. Sri Prakasa, Minister for National Resources and Scientific Research

when formally opening the new building of the Institute at Delhi last month. He urged that science and industry should assist each other, and deprecated the increasing tendency to depend on Government help rather than private initiative. He felt that the best could be done outside the Government, for interference by the latter would mean only an extension of bureaucracy, which was not good for the country.

Rhodesia Expansion

It is announced that the Southern Rhodesia Government proposes to allocate £1,000,000 for the construction of a new power station at Lusaka, in addition to £30,000 for additional transmission lines, etc., to bring more power to Lusaka from Chilonga. The Government has also decided to veto the plan to provide a new electrical system for Broken Hill.

O.H. or Underground?

The time was not appropriate to change from overhead to underground distribution of electricity in New Zealand, according to Mr. J. C. Forsyth, president of the Electric Supply Engineers' Institute, in his address presented to the annual conference recently. In the past the cost of materials had been more favourable toward overhead distribution in New Zealand than in older countries, he said. Poles had been of better lasting qualities, and local labour had been dearer, operating against the adoption of underground distribution, except in favourable circumstances. Conditions arising out of the war changed those conditions greatly and it remained to be seen whether the older countries could continue to use underground distribution to the extent which they had in the past and also provide electricity at satisfactory cost to consumers, he continued. The phenomenal growth of residential supply in New Zealand since 1920, in spite of the retarding effects of the depression, the war and the electricity shortage, was due largely to the comparatively low cost of supply made possible by the adoption of overhead distribution. Although it was possible to improve the appearance of streets by eliminating overhead lines, Mr. Forsyth wondered how many residential consumers would accept the consequent increase in electricity costs.

Geothermic Experiments

The men working on the geo-thermal power survey at Wairakei had been successful in their search for "dry" steam, but the bores would have to go deeper to get beyond a deep ground water system, which had been struck by nearly all of the 14 bores sunk in the area, it has been disclosed by Mr. A. E. Davenport, general manager of the State Hydro-Electric Department. A drill to go 2,000 ft. deeper had been purchased. Recently a shallow bore of 500 ft. or so emitted dry steam. This indicated it could be obtained there if the ground water was absent or only there in small quantities, he said. Illustrating the power of the steam in the area, Mr. Davenport quoted a four-inch bore 575 ft. deep which discharged 120,000 to 130,000 lb of water and steam every hour. Its pressure under a closed valve was 200 lb. Subsequently, he said, it was desired to have a station of about 10,000 kW which would make it a real test of the availability of the steam. Offers had been received from overseas to design whatever pilot plant was desired, he added.

Load Control

An examination of the position in regard to the installation of plant for the control of non-essential load, such as space and water-heating, has been given in a report prepared by Mr. G. H. Battersby, acting engineer-manager of the Christchurch (N.Z.) Municipal Electricity Department. To install the system in the corporation's area might cost well over £100,000, and would take some years. The system had been considered, but no action taken. He considered that the present quota rationing could be quite as satisfactory and in view of the cost and the delay in obtaining other equipment, it would not be practicable to install it in the present emergency.

Railway Electrification

The N.Z. Government intended to go ahead with the electrification of North Island railways as soon as possible, but because of the country's large commitments essentials must come first. Mr. Goosman, Minister for Railways, declared recently, but he would give no approximate date of when a start on the electrification work could be expected.

O.H. Cable Needed

Immediate representations by the N.Z. Government to the U.K. to get overhead cable, orders for which have been refused by manufacturers, is suggested by the Electric Supply Authorities' Association of N.Z. Mr. G. R. Keenan, of the Auckland Board, said the refusal of orders appeared to be due to (1) the shortage of copper made available to manufacturers by the British Ministry of Supply, and (2) a condition that copper could be used only where a considerable value of other materials and labour must be spent in its manufacture. If supplies of cable did not arrive it would affect any increase in primary produce for export to Britain, he added.

Ban Unsafe Apparatus?

A proposal put forward at the recent New Zealand conference suggested that the New Zealand Government should ban the manufacture, importation and sale of unsafe electrical equipment and apparatus not safely wired. It was decided to support a remit to the Power Boards and Supply Authorities' Association conference pressing the Government to frame these regulations. Mr. H. S. Maunder of Wellington pointed out that they were in the embarrassing position of having to say that appliances did not conflict with the regulations, knowing that they were no good; but they could not take any necessary action to stop them.

PERSONALITIES

IN THE INDUSTRY

We learn that **Mr. James F. Magee,** A.S.T.C., A.M.I.E.E., A.M.I.E.(Aust.), engineer representative in London for the Sydney County Council since May, 1947, has elected not to transfer at this stage to the Electricity Commission of New South Wales and is to return to Sydney before the end of the year. He has been appointed to the senior position of distribution engineer in the Council's service, with responsibility for such activities as project supervision of the 33 kV transmission and distribution networks, financial matters associated with the cost of giving supply, and the determination of rate structures, planning and investigations and negotiations with large power consumers. Many in Britain will be sorry to lose Mr. Magee, for during his four and a half years here he has made a wide circle of friends, and we feel sure also that he himself regrets having to break these ties. But we wish him all success back in the Commonwealth.

Mr. J. F. Magee

At a meeting of the directors of Crompton-Parkinson, Ltd., last Friday, **Mr. Arthur Parkinson** was appointed a director of the company. He is the only son of the late Mr. Frank Parkinson, the former chairman of the board. He has been an executive director of the company since 1946.

At present executive vice-president of the Detroit Edison Co., U.S.A., **Mr. Walker L. Cisler** has been nominated president and general manager of the company as from December 1. He will succeed Mr. J. W. Parker, who has been president since 1944. Mr. Cisler joined the Detroit Edison Co. in October, 1943, after extensive experience in the U.S. supply industry. Since the war he has been chief consultant on electric power for the Economic Co-operation Administration and has also carried out notable work with the Atomic Energy Commission.

In recognition of 51 years' service with Liverpool's electricity undertaking, **Mr. E. L. Morland,** M.B.E., M.I.E.E., sub-area engineer, No. 1 sub-area of the Merseyside and North Wales Electricity Board, has been presented with a rose bowl on his retirement. The presentation was made by **Mr. P. Bregazzi,** M.I.E.E., A.M.I.Mech.E., sub-area manager, who paid tribute to Mr. Morland's valuable services. It was followed by a complimentary dinner attended by 67 former colleagues and by **Mr. J. Eccles,** C.B.E., M.M., B.Sc., M.I.E.E., M.Inst.C.E., M.I.Mech.E., chairman of the Board.

A part-time member of the North Eastern Electricity Board, **Mr. C. I. C. Bosanquet,** M.A., has been nominated Rector of King's College, Newcastle-upon-Tyne, to succeed **Lord Eustace Percy,** who retires in October next year. Mr. Bosanquet has held a number of business and executive appointments, including a directorship of the North-Eastern Electric Supply Co.

Deputy managing director of E. K. Cole Ltd., **Mr. N. C. Robertson,** M.B.E., F.R.S.A., Assoc.I.E.E., has accepted the appointment of director-general, electronics production, the Ministry of Supply announces. He will take over his new duties, which are on a voluntary basis, early this month. Mr. Robertson will be responsible for the production of all radio, radar, telecommunication and electronic equipment for the Ministry of Supply. He has been connected with the radio industry since 1924, when he was apprenticed with the Sterling Telephone and Electric Co. Ltd. From 1926 to 1928 he was with Marconi's Wireless Telegraph Co. Ltd., and from 1928 to 1930 chief inspector with Kolster-Brandes. He has been with Ekco's since 1930, having successively held the position of chief inspector, production manager, works manager, director, and from 1945, deputy managing director.

Mr. N. C. Robertson

Recently appointed contracts manager of the Foster Switchgear Division of Crypton Equipment Ltd., is **Mr. R. W. Ell.** He will operate from the company's London office where he will act in a technical sales and advisory capacity for the complete range of Foster H.I. switchgear. Mr. Ell joined what is now Foster Transformers and Switchgear Ltd. in December 1938 as senior draughtsman engaged on switchgear and kiosks. In 1939, he became design and contracts engineer in the switchgear department, and was made chief switchboard designer in 1946. Two years later, he was appointed assistant contracts manager, dealing with both transformers and switchgear.

Mr. R. W. Ell

The elections last Thursday provided no additional members of Parliament who have associations with the electrical industry. But among the new M.P.s (with constituencies in parenthesis) are (Conservatives): **Rt. Hon. Oliver Lyttleton,** D.S.O., M.C., chairman of Associated Electrical Industries, Ltd. (Aldershot); **Mr. F. J. Erroll,** M.A., A.M.I.E.E., A.M.I.Mech.E., director, W. J. Furse and Co., Ltd. and other concerns (Altrincham and Sale); **Sir Arnold Grindley,** K.B.E., M.I.E.E., chairman and joint managing director of Mawdsleys, Ltd. and a director of many other electrical concerns (Stockport South); **Mr. C. I. Orr-Ewing,** O.B.E., B.A., A.M.I.E.E., commercial adviser (technical) to A. C. Cossor, Ltd., and a director of Cossor Radar, Ltd. (Hendon North) and **Hon. J. Grimston,** a director of Enfield Rolling Mills, Ltd. and other companies. The Labour Party's M.P.s include **Mr. J. Chuter Ede,** a past president of the British Electrical Development Association, and chairman of the old London and Home Counties Joint Electricity Authority (South Shields); **Mr. C. R. Hobson,** a power station engineer, a former member of the J.I. Council for the Electricity Supply Industry, and for 10 years chairman of Lots Road and Neason Power Station Workers' Committee (Keighley); **Rt. Hon. Hugh Gaitskell** (Leeds, South), and the **Rt. Hon. P. J. Noel-Baker** (Derby, South), both former Ministers of Fuel and Power; **Mr. T. F. Cook** (Dundee, East), and **the Rt. Hon. R. R. Stokes,** late chairman and managing director of Ransome and Rapiers, Ltd. (Ipswich). All were in the previous Parliament. In the New Cabinet, **Lord Leathers** has been nominated Secretary of State for the co-ordination of Transport, Fuel and Power. He will be concerned with issues of policy affecting that group of industries. The Rt. Hon. Oliver Lyttelton has been appointed the Secretary of State for the Colonies.

In our note last week of the Simplex branch managers' conferences, a slip occurred in the names. Shown in our photograph, left to right, were **Mr. J. D. Johnson,** manager of the Simplex Division, **Mr. E. G. Plucknett,** director and joint general manager, and **Mr. A. G. Jones,** director and joint general manager.

Formerly assistant commercial manager of the Light Group of Philips Electrical, Ltd., **Mr. R. P. Sayers,** F.I.E.S., M.S.M.A., has now joined Ashley Accessories, Ltd., as sales manager. Mr. Sayers served with Holophane as a lighting sales engineer prior to joining Philips in 1934 to develop the applications and sales of discharge lamps and lighting. Later he was manager of that company's Lighting Department, and sales of fluorescent, mercury and sodium lamps and equipment.

Mr. R. P. Sayers

Shortly to take up his duties as power station superintendent at the new Plymouth 'B' station, South Western Division of the B.E.A., is **Mr. B. Sidebottom,** A.M.C.T., A.M.I.Mech.E., who is now deputy station superintendent at Meaford power station in the Midlands Division. Gaining technical education at Manchester College of Technology, Mr. Sidebottom took up an engineering apprenticeship with C.P.A. Ltd. prior to getting power station training with the Manchester Corporation Electricity Department. After a period with the Oldham undertaking at Greenhill and Chadderton power stations, he returned to Manchester as shift charge engineer at Stuart Street generating station, holding that post till going to Meaford as deputy station superintendent.

Mr. B. Sidebottom

The English Electric Co., Ltd., announce the appointment of **M. C. Timewell** as manager of their Domestic Appliance Division. For ten years Mr. Timewell directed the activities of the International Refrigerator Co., Ltd. During the war he served in the Royal Navy in a technical capacity. After the war he was a founder member of Design Research Unit.

Mr. C. Timewell

Previously deputy power station superintendent at Hams Hall "B" station, Midlands Division, B.E.A., **Mr. E. H. Cook,** A.M.I.E.E., has been promoted to station superintendent at that station.

Mr. Alexander Logan, A.M.I.E.E., who has been deputy area manager for the Cowal Area of the North of Scotland Hydro Electric Board, has been appointed area manager for that area in succession to **Mr. A. Earls,** B.Sc., M.I.E.E., A.M.I.Mech.E., who has resigned to take up an appointment as chief engineer to the Electricity Corporation of Nigeria, at Lagos (as we have already reported). Mr. Logan's office will be at Electricity Works, Dunoon.

Mr. Ashley Edwards has been appointed a director of Sangamo-Weston, Ltd.

Mr. A. D. Monk was recently appointed manager of the Leicester branch of Simplex Electric Co. Ltd. Mr. Monk, who had been acting branch manager at Leicester since August 1950, joined Simplex in 1938. After war service he re-joined Simplex as a sales representative.

Mr. J. E. Price, A.M.I.E.E., who has been with Lancashire Dynamo and Crypto (Mfg.) Ltd. for 36 years, has been elected a director of Malcolm and Allan (London) Ltd., an associated "Lancashire Dynamo" company. He will continue to operate from the London Office of L.D.C. which he joined originally in 1924 after 12 years at the Company's Trafford Park works where he also served his apprenticeship. Despite his many years in London Mr. Price has maintained a keen interest in Lancashire affairs and is this year's Chairman of the Committee of the Association of Lancastrians in London and Honorary Steward of the Manchester Grammar School Old Boys' London dinner.

A presentation was recently made to **Mr. H. Bull,** principal electrical overseer with the Admiralty, Newcastle-on-Tyne, who has received an appointment in London. The gift, a wrist watch, was handed over by **Mr. W. N. Conning,** warship electrical superintendent for the North-East Area.

OBITUARY

Dr. H. W. Malcolm, M.A., Ph.D., D.SC., A.M.I.E.E., died on October 25, aged 70. He was formerly in charge of submarine cable manufacture for the India Rubber, Gutta Percha and Telegraph Works Co., Ltd., and had been adviser to Imperial International Communications, Ltd., and latterly acted as a consulting telegraph engineer. He was also author of a textbook on "The Theory of the Submarine Telegraph and Telephone Cable."

Mr. P. E. Banting, sometime manager of the Manchester district office of the British Thomson-Houston Co. Ltd., died on October 18, aged 72. He served an apprenticeship with Crompton and Co., before joining B.T.H. in 1902 as a tester, and later served in various engineering and commercial departments until the 1914-18 war. After war service he became manager of the company's district office, relinquishing that post in the early twenties to become a partner in the firm of Banting and Tresilian Ltd.

NEW LITERATURE

Selected Engineering Designs

UNDER the title of Festival of Britain, 1951, the Association of Consulting Engineers have produced a volume dealing with "Selected Engineering Designs." The subjects covered are wide and diverse in scope ranging from extensive engineering works such as the laying of large sewerage schemes, the building of the Festival Hall, dam construction and so on, to the detailed design of power-station plant. Although by far the greater portion is devoted to civil engineering, there is much to interest the electrical engineer, particularly as far as recent power stations and hydro-electric schemes are concerned.

The contributions have been produced by an impressive array of consultants covering all branches of the industry. Published by Princes Press Ltd., 321 pp., 10 in. by 13½ in. Price £3 3s.

Small Non-Commutator Motors

by Wynne I. McDougal and Kennard C. Graham

THIS is essentially a book for the student and the technician rather than the designer, and those who are addicted to circle diagrams will search for them in vain. On the other hand, those who prefer their theory in simplified form will find the book exceptionally interesting. To say that it covers the ground thoroughly is a gross understatement, since it commences with the basic principles of magnetism and concludes with a chapter on fault-finding. The presentation, too, is refreshingly original. Each chapter is prefaced by a synopsis headed "Questions Chapter — will answer for you," and a few of the questions selected at random: "How are poles produced in the single-phase rotor?"; "What is the finger-roll method of installing coils?"; "What is service factor?" indicate the scope of the book. Not content with telling the reader what he is to learn, each chapter makes sure he has assimilated it by adding a summary, a set of questions and answers and, just to keep him on his toes, a set of questions without answers. Published in the U.S. by the American Technical Society, the book is handled in Britain by the Technical Press Ltd., of Gloucester Road, Kingston Hill, Surrey, 265 pp., 8¼ in. by 5¼ in. Price 35s. net.

Elementary Electrical Engineering

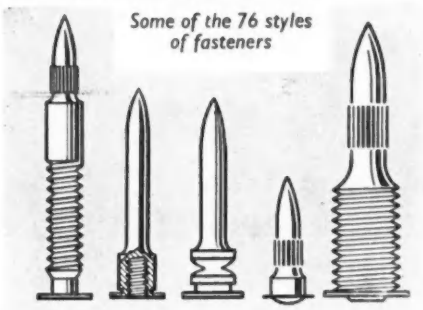
by A. E. Clayton, D.SC., A.K.C., M.I.E.E. and *H. J. Shelley,* O.B.E., B.SC., A.M.I.E.E.

DESIGNED for use in connection with an Ordinary National Certificate course, this present volume has now reached its third edition, and perhaps its most unattractive feature is that revision has failed to remove all signs of its 1927 origin. The authors cover their ground with a solidarity of treatment that, useful in a reference volume, may make this textbook difficult to learn from. Other signs of its early origin are given in such sentences as "within the last few years a type of wiring cable has come into use which is contained in a lead sheath." This much said, it has to be admitted that there are many good points about the work, notably the great amount of useful information it offers at a reasonable price. In this third edition, two new chapters have been added, one on elementary circuit analysis, including the method of superposition, and the other a detailed treatment of tuned circuits. The chapter on electric lamps has been expanded and brought up to date. Published by Longmans, Green, 490 pages, 7¼ in. by 4¾ in. Third edition, price 14s.

GUNNING FOR SAVINGS

U.S. Cuts Cost with Powder-Operated Tools

THE use of powder-operated tools for speeding up construction and contracting work is well-established in the U.S. where, it is estimated, 2,500,000 fastenings each month are fixed by this method. Although mentioned by Mr. S. L. M. Barlow in his paper on new techniques in the contracting industry read to the E.C.A. in May, 1950, very little information has hitherto been available in this country. Through the courtesy of Portable Industries Inc., of Cleveland, Ohio, we are now able to give some details of the "Ramset" powder-operated fastener.



Some of the 76 styles of fasteners

By its use, the setting of fixings appears to be a simple operation. Instead of drilling steel or concrete by conventional methods and using either plugs or an expanding bolt, the fixing (in the form of a plain spike, stud, internally threaded stud, etc.) is simply fired into the steel or concrete from a portable gun about the size of a pneumatic hammer, using a charge in cartridge form, graduated to the material and size of fixing used.

Time

The most spectacular advantage claimed for powder-set fastenings is, of course, the saving in time and, consequently, in cost per fixing. Three comparative costs studies on typical jobs have been made available to us. All were carried out by the Trundle Engineering Co. of Cleveland, the actual contractors being different in each case.

In the first job, anchoring steel straps to either the underside of a concrete floor or to a steel beam, the conventional method involving drilling either concrete or steel and punching a suitable hole in the strap, took from 15-30 minutes, according to the accessibility of the location, whereas the powder setting took less than one minute. Comparative costs of labour and material totalled 23c. per position as against 79c. to $1.52 for conventional methods. Even larger savings were shown in the installation of pipe hangers in an inaccessible duct, where the powder setting took 0·65 minutes against 44-59 minutes for conventional methods.

Left: Light-duty Ramset gun

Heavy-duty Ramset gun

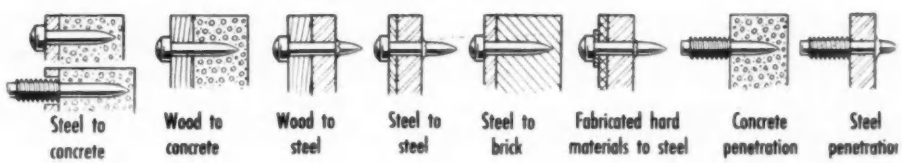
The third study related to the installation of bridle rings for communication cables in a concrete ceiling, which showed a saving which was not quite so spectacular since the cost of the materials offset the saving in time rather more, and although the time was cut from nine minutes to just over one minute, the saving in cost was some 13c. per position.

Holding Power

Reports on tests taken by the Pittsburgh Testing Laboratory on the holding power of the fasteners are also given. A series of tests on studs in concrete showed that the average pull required to remove studs varied from 890 lb for a light (0·15 in.) stud with a shank length of 1 in. to 1,740 lb for a ¼ in. stud 2½ in. long.

In steel, a 0·15 in. dia. stud fired into ¼ in. m.s. plate required an average of over 2,000 lb pull to remove it, while a ¼ in. dia. stud fired into ⅜ in. plate required over 7,000 lb average pull.

Some of the fixing combinations possible

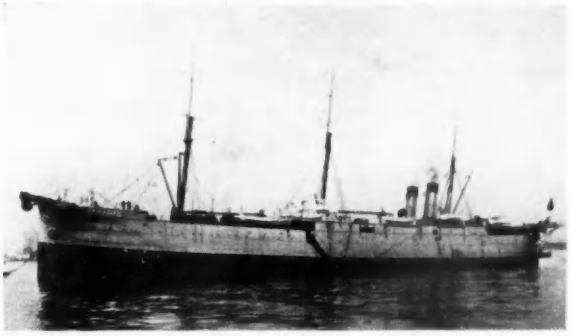


First Cable Ship "Faraday" Ends Her Days

AFTER 28 years of retirement as a coaling station at Algiers, the 5,000 ton cable ship *Faraday* is now in the shipbreakers' yard at Newport, Mon. There is always a feeling of sadness about a ship's last voyage to the scrap heap, particularly when she has contributed valuable service, as did the *Faraday*, laying over 50,000 miles of submarine cable, including eight trans-Atlantic cables.

Built for Siemens Bros. and Co., Ltd., and launched in 1874, her first voyage was in connection with the Direct U.S. Cable, the first telegraphic communication between this country and America. Two more trans-Atlantic cables were laid by her in 1881 and 1882, and it should be noted that at that time the owners refused an American millionaire's offer to buy her. Nearly 30 years later the ship had the distinction of laying the first "loaded" submarine telephone cable across the English Channel.

The *Faraday* had three large cable tanks and was equipped with all necessary machinery for laying and repairing cable. We understand she was one of the first ships to be fitted with twin screws and it has also been claimed that she was the first vessel afloat to have electric light. Two rudders, one fore and one aft, enabled her to be manoeuvred easily and a distinguishing feature was the two funnels, which were arranged abreast. When in 1923 she finished her work as a cable ship, she was replaced by another bearing the same name.



Siemens' cable ship "Faraday" before her final voyage to the shipbreakers' yard. In nearly 50 years service she laid 50,000 miles of cable

BRITISH STANDARDS

Dry batteries for domestic radio receivers. *B.S.* 1766 : 1951. *Price* 2*s*. This British Standard prescribes the dimensions and performance of a range of dry batteries for domestic radio receivers and allied equipment. Experience has shown that the information in *B.S.* 397 : 1946, "Leclanche-type primary cells and batteries," in respect of dry batteries for radio receivers, is inadequate in the light of present-day needs, and the present document has been prepared. It embodies the relevant data from *B.S.* 397, together with details of the sizes of radio battery plugs, and a description of the connectors.

Portable Fire Extinguishers of the Carbon Tetrachloride Type. *B.S.* 1721: 1951. *Price* 4*s*.—This standard is an entire revision of that part of B.S. 740 which covered carbon tetrachloride fire extinguishers. All types of carbon tetrachloride fire extinguishers are now provided for, and the standard defines what is meant by the various types. Details are formulated of the materials to be used, the type and dimensions of the various parts, as well as details of construction. The British Standard furthermore gives methods of testing the fire extinguishers at various stages of manufacture, and provides details of marking. Appendices give comprehensive details of fusion and resistance welding.

Grommets for General Purposes. *B.S.* 1767, 1951, *price* 2*s*. No attempt has been made in this standard to specify all the materials from which grommets can be made, as it is realized that materials may be developed in the near future which may be satisfactory in every way. Attention has, therefore, been confined to the natural rubbers and synthetic rubbers and rubber-like materials such as polyvinyl chloride, which were being used at the time this standard was prepared. Minimum physical test requirements are laid down together with some additional tests to meet special requirements. A table of dimensions for a standard range of grommets from $\frac{1}{4}$ in. up to and including 3 in. is included.

An appendix has been included setting out a suitable method for testing the resistance to exposure cracking of rubber and synthetic rubber grommets.

15-amp. Three-pin Plugs, Socket Outlets and Connectors for Theatre and Cinema Stage Use. *B.S.* 1778, 1951, *price* 2*s* 6*d*. This standard provides for plugs and sockets which are dimensionally interchangeable with the 15-amp. three-pin plugs and sockets of the round pin type specified in B.S. 546, and it includes all the essential requirements relating to materials and to the construction of the principal parts of the connectors. To meet the severe conditions which are imposed by stage use, the standard, in addition to such general requirements as are specified for domestic connectors in B.S. 546, includes more stringent requirements in respect of current making and current breaking capacity, effectiveness of the cord grip and general mechanical strength.

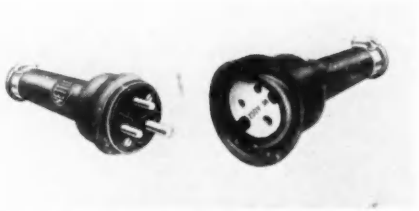
Copies of these standards may be obtained from the British Standards Institution, Sales Department, 24 Victoria Street, London S.W.1.

The BUYER'S *Column*

Rubber Cable Coupler by Nettle

THE new 5-amp 3-pin watertight rubber cable coupling which has been introduced by NETTLE ACCESSORIES LTD., Harper Road, Wythenshawe, Manchester, will help to meet a demand that has been apparent for a number of years if this column bears in mind the number of enquiries for such an item received each week by the ELECTRICAL TIMES Enquiry Bureau.

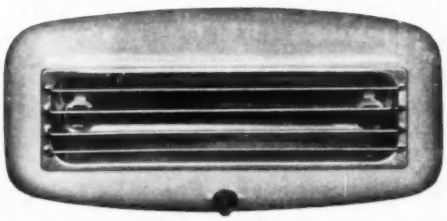
This coupler, essentially a 3-pin plug and socket, will prove popular for such uses as agricultural machinery, electric hedge cutters, and lawnmowers, and many industrial applications. An acid proof model is also available. The unit has a heavy porcelain interior to withstand rough usage, both sections being easily removable for wiring, etc. Cable entries accept up to three-core heavy-duty 70/0076 gauge, pin centres being to B.S.S. 546. The rubber flange which is apparent in the illustration seals together the two sections of the coupler, whilst a clip provided at each cable entry allows the rubber sleeves to be clamped tightly to the cable.



Nettle's new rubber plug will find a ready market

New Creda Flat-Back Fire

JUST released by SIMPLEX ELECTRIC CO., LTD., Oldbury, Birmingham, is a new one kilowatt fire especially designed for permanent wall mounting. It has attractive simple lines which coupled with the high standard of workmanship presents at a list price of £2 10s. (not including purchase tax) a valuable aid to winter warmth without too great a strain on peak hour power resources.



The element is a 1 kW "Solex" controlled by a D.P. switch. The body is constructed of pressed aluminium finished cream stove enamel. The reflector is polished aluminium.

Liquid Envelopes

IN a reference to "liquid envelopes" by this column in our September 27 issue, we inadvertently made the suggestion in our note that this liquid material was evolved by Export Packaging Services Ltd. This is not quite correct. Export Packaging Services have evolved the various forms of packaging using this plastic material which is actually manufactured in this country under licence from the American manufacturers by JENSON & NICHOLSON LTD., 36 St. James's Street, London, S.W.1, makers of "Robbialac" paints.

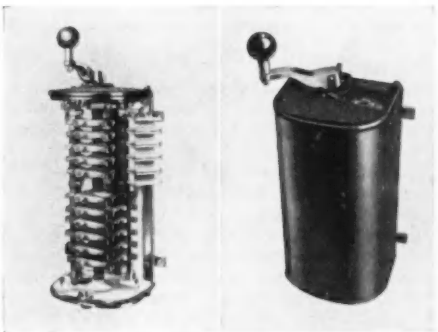
de Renzi-Holmes new "00" controller

NEW addition to the range of reversible cam-operated contactor controllers marketed by DE RENZI-HOLMES & CO. LTD., Fox's Lane, Wolverhampton, is the "00" controller.

Suitable for circuits up to 600 V and currents up to 50 amp. the "00" controller, due to its compact design is especially suitable for use in small crane cabs and applications where space is limited.

Main features of the larger models by the firm, have been incorporated and particular attention has been given to the easy and positive operation of the controlling handle.

A special safety feature is the fitting of individual magnetic blow-out coils to all main current breaking contactors. Complete speed control can be effected on all notches in both direction, together with "creep" speeds, and braking control for either d.c. or a.c. machines.

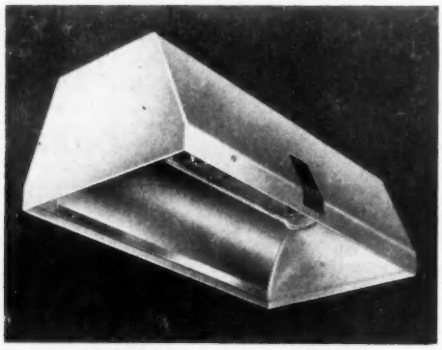


The "00" controller with and without its casing

Plant Irradiation

INVESTIGATION into the effect of artificial light in speeding plant culture which has been carried out at the John Innes Horticultural Institution at Bayfordbury, Hertford (see ELECTRICAL TIMES, July 19 1951), has been recently proved to be both sound and economical.

Bearing in mind these points and the considerations involved, the GENERAL ELECTRIC CO. LTD., Magnet House, Kingsway W.C.2, has designed a suitable illuminating unit which has an inexpensive form of construction and at the same time has the optimum light distribution. It is also soundly made and is safe to use. The light source consists of an Osram mercury vapour lamp arranged for horizontal burning and is of a type which has been widely used for many years for street lighting.



G.E.C.'s fitting for plant irradiation

Eltron Engine pre-heater

AN interesting engine pre-heater has been introduced by ELTRON (LONDON), LTD., of Accrington Works, Strathmore Rd., Croydon, Surrey, in readiness for the forthcoming season of frosty mornings and freezing nights.

The small heater is clamped to the side of the cylinder block transferring its heat to the water in the block and by thermo-syphonic action throughout the engine. An Eltron ring type element is enclosed in a small cup shaped vessel, a tee-headed bolt passes through the cup and into the cone plug hole found on the side of most engines. When the bolt is tightened the engine pre-heater is clamped tightly against the engine casting. The heater is connected to either a.c. or d.c. mains supplies of standard voltages.

There are four patterns: TMe, rated 375 W for circulating water capacity of 20/30 pts, price £4 10s; Type CLe, 500 W/30/38 pts, £4 10s; Type CMo, 750 W/38/48 pts, £5; Type CMool, 1,000 W, £5 10s.

Result of fitting an Eltron heater is that your engine is as hot when you start it in the morning as it was when switched off the previous night.

We understand that there is a demand in industry generally for this interesting heater.

TRADE PUBLICATIONS

BOILER TREATMENT. Technical Publication No. 184 issued by the Feedwater Specialists Co. (The Liverpool Borax Co. Ltd.), St. Paul's Square, Liverpool 3, contains an article "Priming Foaming and Carry-over," by G. S. Irving, M.I.CHEM.E., A.R.I.C.

AIR CLEANSING. New publication 7104 entitled the "Precipitron" gives an interesting illustrated description of the electrostatic air filter designed and marketed by Sturtevant Engineering Co. Ltd., Southern House, Cannon St., London E.C.4.

RELAYS. A new English Electric publication now available is entitled "Floating armature relay type OJL."

WATER PURIFICATION. Entitled "For scale prevention and corrosion control—Micromet", a new publication by Albright & Wilson Ltd., Oldbury, Birmingham, describes the use of this new Micromet system.

LATHES. Pultra Ltd., 24 Gravel Lane, Salford 3, have issued a leaflet illustrating and giving a specification of the Pultra Series 15 Lathe.

FLUORESCENT LIGHTING. A broadsheet is now available from Metropolitan Vickers Electrical Co. Ltd., 1-3 St. Paul's Churchyard, E.C.4, illustrating their new range of fluorescent fittings.

GAS AND CIGARETTE LIGHTERS. Leaflets dealing with the mains electric cigarette and gas lighters formerly made by Krivert Ltd. and now made by Belark Tool and Stamping Co. Ltd. and distributed by Truvox Engineering Co. Ltd., Exhibition Gds., Wembley, are available from the latter company.

METERS AND INSTRUMENTS. "Mastery of Measurement" is an appropriate title for a new brochure issued by Marconi Instruments Ltd., St. Albans, Herts. It surveys and gives specifications for each unit in the wide range of electric and electronic measuring equipment marketed.

SWITCHGEAR. A specification folder issued by Simplex Electric Co. Ltd., Broadwell Oldbury, Birmingham, and dealing with switch splitters is the first of a new series of folders to be published replacing Simplex Switchgear list SW.1690.

LINE TRANSMISSION EQUIPMENT. Engineering Bulletin 2223 issued by the Automatic Telephone and Electric Co. Ltd. of London and Liverpool, deals with a twelve-channel carrier system for use on cables designed and manufactured jointly by the company and the Telephone Mfg. Co. Ltd.

LAMPS. Catalogue of Metrovick Lamps for general use and for special purposes is publication SP7101/2-2, issued by Metropolitan Vickers Ltd., 3 St. Paul's Churchyard, London E.C.4.

LADDERS. Now available from Wm. Randall and Co. (Horsham) Ltd., Mannings Heath, Horsham, Sussex, is a price list of the many types of ladders and trestles, etc.

THE WEEK

COMMERCE *in news* INDUSTRY

Seven E.T.U. Members Win Claim

SEVEN members of the Electrical Trades Union who refused to take part in an "unofficial" strike which eventually involved about 2,000 electricians employed by Area Boards last February, were granted an injunction in the Chancery Division on Tuesday restraining the Union from punishing them or threatening to do so. They were also given a declaration that the Union had no power to make payments to men on unofficial strike. Mr. Justice Wynn Parry ordered that all costs be paid out of the Union's funds.

Appeal to save Scrap Metal

AN appeal for a nation-wide drive for brass, bronze, lead and zinc scrap was made by Mr. S. W. Platt, president and director of Platt Metals Ltd., at a meeting of the National Association of Non-Ferrous Scrap Metal Merchants. The drive would be comparable to the intensive campaign for scrap iron and steel collection. In his appeal Mr. Platt urged all industrial concerns to search their stores and corners to gather all odds and ends of scrap. He said over 40% of non-ferrous metal consumed in Britain was scrap metal, its value being about £100 million. Every 1% of scrap saved therefore meant £1 million, which would not only mean more for the consuming industry but also less to be bought from abroad.

Power Development in Portugal

THE main object in Portugal at the present time is to make available cheap power from national resources instead of from imported fuel. To this end development of hydro-electric power has been planned to reach a potential production of some 2,250 million kWh by 1960. Planned hydro-electric production for this year is 1,100 million kWh. Although the target has been set, it is probable that shortage of funds will cause a slower pace of development than was originally envisaged. The latest Economic Survey, published by H.M.S.O., which details the above information, gives the total amount of electricity generated in 1949 as 836·6 million kWh.

During the past few years also, Portugal has turned from the U.S. to Europe for the supply of many materials. This caused a reduction of imports from the U.S., which was mainly on such items as industrial machinery, radios, generators, motors and transformers. Nineteen forty-nine showed some redistribution of European countries share in imports of machinery, apparatus and instruments.

Cost of Living Problem Again

WITH a principal export of bananas, and whisky as one of the main imports from this country, Honduras does not readily appeal to the electrical engineer as a prospective market. We find also, among the pages of the Economic Survey of that country, that increased cost of living has put practically everything except bare essentials beyond the reach of the masses. Despite, however, the predominence of American interest in Honduranean commerce there is no prejudice for U.S. products, in fact imports from Europe have steadily increased during the past few years. Prospects concerning agricultural machinery are particularly favourable. Mineral resources of the country are claimed to be considerable and include the much sought-after materials, iron, copper, tin and lead, but little is being extracted due to transportation and other difficulties. We note, however, plans for the Rio Lindo hydro-electric scheme, but the Survey lacks any information on this project.

Cooker Sales Maintained

HOME sales of cookers had remained steady and production maintained in spite of the demands of defence and consequent shortage of raw materials, said Mr. Percy Tonks, chairman of the Domestic Electric Cooker section of B.E.A.M.A. at the section's fourth annual dinner. He was replying to the toast of the section proposed by Col. B. H. Leeson, director of B.E.A.M.A., and added that electric cookers had become increasingly prominent among our exports of electrical equipment. He also spoke of the cordial relation-

The First Half-Century

The trial of polyphase traction began on Tuesday morning. The judges are the Hon. Alfred Lyttelton, chosen under the provision of the Act of Parliament because he is supposed to know nothing about electricity or traction, and to help him Mr. T. Parker and Mr. Parshall, selected because they know all about it, and having considered the issue already are believed to have made up their minds irrevocably in opposite directions. A majority decides and the sentence is to be pronounced afterwards by the Board of Trade.—*From our issue of October* 31, 1901.

Eleven rows of 21 fluorescent lamps are employed in this installation in a hangar at Whenuapai airport, Auckland, designed by the General Electric Co.

ship with the B.E.A. and Area Boards, saying that cooker manufacturers could rely on the sympathy, if not active support, of the supply side in the problems which had to be faced. Mr. Tonks has been chairman of the section since 1948, and was vice-chairman between 1943 and 1948.

Fluorescent Lamps in N.Z. Hangar

OVER 230 twin-lamp reflector fittings housing 5 ft 80 W fluorescent lamps are used to illuminate the large aircraft maintenance hangar at Whenuapai airport, Auckland. The installation was designed by the Wellington (N.Z.) branch of G.E.C. There are 11 rows of 21 fittings each spaced across the hangar, the two side rows being mounted in the angle between walls and roof and with half reflectors only. Wooden battens were used to support the fittings, suspended from wire catenery cables strung across the building. Mounting height is 28 ft and the scheme provides an illumination of 20 lm/ft^2 at the level of aircraft engines. The hangar itself is 220 ft long, 170 ft wide and 65 ft high and is of reinforced concrete construction.

Employed or Unemployed

NUMBERS employed in the electrical industry at the end of August show increases in all branches over the preceding month and over the final figures of 1950, according to the latest statistics published by the Ministry of Labour Gazette. The steepest rise since the end of July is accredited to electrical machinery with an increase of 1,700, to 177,500. This is also true when comparing latest figures with those of 1950, for the increase there is 4,600. At the other end of the scale, the smallest increase is in the wires and cables group which rose by 100 to 49,100. At the end of 1950 this figure was 48,100. In the supply industry, those employed in August numbered 186,700 compared with 186,500 in July, and 184,000 last December.

Conversely, the highest number wholly or temporarily unemployed as on September 17 in any branch of the industry was 798 in the manufacture of miscellaneous electrical goods. Second in this list was electrical machinery with 670, and at the bottom of the table, batteries and accumulators with 117. On the supply side, total unemployment was 543.

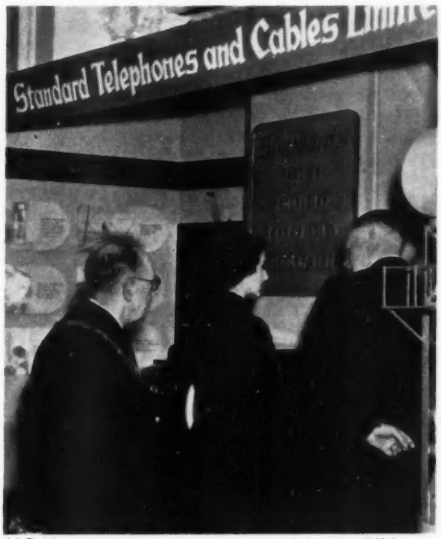
New Import List

DUE to the large number of changes in import licensing arrangements since the last consolidated list was published in September, 1950, new and amended lists have now been made available. These cover goods exempt from import licensing when shipped from particular countries. It is known as "Notice to Importers No. 458" and can be obtained from the Board of Trade, Romney House, Tufton Street, S.W.1.

Colliery Lubrication

THE mechanisation of collieries began long before the advent of nationalisation. It was halted for a while due to the war and the shortages which followed it, and then, under the aegis of the

An 8-channel Ediswan electro-encephalograph loaded aboard a Scandinavian Airlines System plane for transport to Oslo. Seating accommodation was removed and the aircraft's departure delayed to ship the equipment, which is believed to be the first of its kind to be transported by air



H.R.H. Princess Margaret examining exhibits on Standard Telephones and Cables Ltd.'s stand after the inaugural ceremony at Woolwich Civic Exhibition

National Coal Board, it advanced at an accelerated rate. In order to help miners and mining officials who are now confronted with a great variety of machinery, both above and below the surface, C. C. Wakefield have produced a book covering the lubrication of all types of colliery plant and equipment. The range dealt with is remarkably comprehensive. Nothing is missed out from the steam engine or turbine used for power generation, to the coal cutters and diesel locomotives underground. The book is available free to our readers interested in the subject upon application to C. C. Wakefield and Co., Ltd., 46 Grosvenor Street, London W.1.

Electrical Industry in Woolwich

THERE was a particular reason for the postponement of Woolwich's Festival exhibition to a month after the main Festival celebrations closed. Last week the Metropolitan Borough celebrated its golden jubilee and to mark the event a comprehensive display of the borough's activities was on view in the town hall. It was opened by H.R.H. the Princess Margaret. No small part is played in the lives of the citizens by members of the electrical industry.

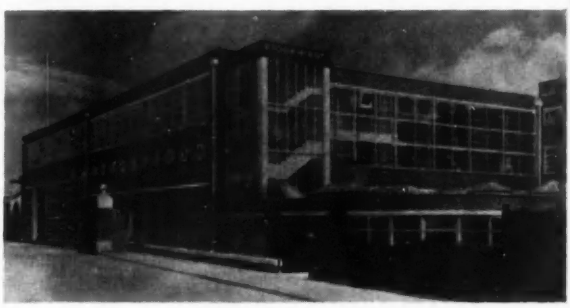
The name of Siemens Bros. and Co., Ltd. has been familiar to residents since 1863 when the company moved in from Westminster. It is said to be the oldest electrical firm in the borough and, we understand, the largest private employer. Exhibits included working examples of marine equipment, samples of power cables and telephone cables and a model of the local telephone exchange. In the same vein, portable microwave television links, coaxial cable links and a demonstration of condenser cones for the prevention of "flashover" at cable terminals were shown by Standard Telephones and Cables Ltd. Various types of cables and wires were also to be seen on W. T. Henley's Co., Ltd.'s stand, a feature of which was a braiding machine used in the production of small electric cables. Prominent in the London Electricity Board's display was "Lebville," an all-electric model bungalow, showing numerous applications of electricity in the modern house.

E.I.B.A. and Command Performance

ONE would hardly say that the Royal Command Performance was a preview of the E.I.B.A.'s annual ball or even dare to put the latter's cabaret on the same level as the variety show of the year, yet once again one of the turns in the E.I.B.A. show has been selected to appear in the Royal Show. The Seven Volants were chosen this year, and following their act on Monday night, they will appear at Grosvenor House on November 9. Readers will probably remember that two years ago, Michael Bentine, who had been engaged for the Association's ball, was also chosen for the Command Performance.

Works Extensions mark Jubilee

ALTHOUGH it is a little over 50 years since the foundation of the Brookhirst Switchgear Ltd., Chester, golden jubilee celebrations took place last week. The postponement was intentional so that festivities could coincide with the completion of large works extensions. In the course of the opening ceremony Mr. J. O. Knowles, chairman, mentioned that the 45,000 sq ft extensions included expansion of assembly, test and inspection departments, new packing bay, warehouse and large social hall. Later in proceedings long service awards were presented to 136 employees who had completed 25 years' service with Brookhirst. We understand that social events for employees celebrating the jubilee lasted over five evenings and ended with a carnival dance last Friday.



A view of the new works extensions of Brookhirst Switchgear Ltd. named Jubilee Buildings to mark the fiftieth anniversary of the firm's foundation

Atlas fluorescent fittings and "double-life" lamps made by Thorn Electrical Industries Ltd. were used in a recent lighting installation at the Brighton offices of the Southern Publishing Co., Ltd. The picture (left) shows the managing director's office where one E49/3 and two GB/3030 units were employed. Warm white lamps were installed throughout. Contractors were W. H. Fellingham and Sons, Ltd.

Short History of Electricity

A POSTSCRIPT to our own reminiscences last week, has reached us in the form of a brochure which the G.E.C. is issuing to its shareholders. Though dealing of course with the company's own progress between 1900 and the present day, it is a short history of the development of the industry over these years. Among the comparisons drawn on opposite pages of the booklet are those between power station and hydro-electric plant, electric motors, transport, communications, street lighting and lamps, as well as G.E.C. headquarters, factories and research laboratories. All pages are headed 1900 and 1951 alternately.

Aluminium in Industry

ANOTHER brochure of historical interest has been published by the Northern Aluminium Co., Ltd. It includes a brief account of the modernisation scheme which has taken place over the past quarter of a century, describing with copious illustrations, the way in which Noral castings and forgings are fabricated at the Handsworth works today. Mention is made of the increasing use of these castings in numerous fields of industry.

Election Load

INTEREST in the results of the general election, and in the arrangement made for their early announcement, produced a marked deviation from the normal B.E.A. load curve on the night of October 25 and 26. At midnight the total load on the system was 6,100 MW, against a normal expectation of 5,000 MW. At one o'clock in the morning the respective figures were 5,150 MW and 4.050 MW, at two o'clock 4,400 MW and 3,800 MW, at three o'clock 4,100 MW and 3,800 MW, at four o'clock 4,000 MW and 3,850 MW, while by five o'clock on Friday morning the demand had returned to its normal value of 3,950 MW.

It is estimated that the increase in units due to the load change during the night was 3.7 million, involving the consumption of approximately 2,400 tons of coal.

Sunderland Station's Birthday

FIFTY years ago today, Sunderland power station went into service. To mark the occasion the N.E. Division of B.E.A. has thrown the station open to the public throughout this week, although the jubilee day itself has been reserved for the visit of wives and families of employees. Admission is by ticket only, and these may be obtained from the Service Centre in Fawcett Street. It is worth recalling that on November 1, 1901, there was less than 1,000 h.p. of plant to supplement that installed at Dunning Street six years earlier. Today, output capacity is 49 MW. Two 10 MW turbo-generating sets were installed in 1927 and a further two 20 MW generators were added towards the end of the 1939-45 war. Celebrations are to continue until Monday next when Mr. J. C. Mitchell, divisional controller, is expected to attend a social for the Authority's employees and friends. Some no doubt will remember the long and staunch service of Mr. A. S. Blackman, borough electrical engineer, between 1906 and 1934, when they meet to celebrate this anniversary.

R/T Extension in Far East

IT was announced last week by Cable and Wireless Ltd. that the Hongkong-Australia radiotelephone service has been extended to New Zealand and opens today, November 1. It is linked to the internal telephone systems of Hongkong and New Zealand, will be available between 1 a.m. and 3 a.m. (G.M.T.) and will be operated in conjunction with the Overseas Telecommunications Commission in Australia and New Zealand Administration.

Chicago Fair to be Permanent

THE Chicago International Trade Fair, it was announced recently, is to become a permanent institution. This decision was inspired by the remarkable success of last year's venture when over 250,000 persons attended and firms representing 44 nations displayed their products in the U.S. for the first time. The next Fair will be held at Chicago's Navy Pier from March 22 to April 6, 1952. Its representative in this country is Mr. A. P. Wales, 16 Shelton Street, W.C.2.

A Guide for Scientific Equipment

THE present-day expansion of the British scientific instrument industry is reflected in the enlarged 1951 edition of the Directory and Handbook of the Scientific Instrument Manufacturers' Association, just published. In addition to giving a list of members of the Association, together with their addresses and trade names, this also provides easy reference to sources of supply of the firms' various products, which many will find of considerable assistance. Copies of the volume can be obtained by enquiry at the Association's headquarters at 20 Queen Anne Street, W.1.

B.E.A. Report

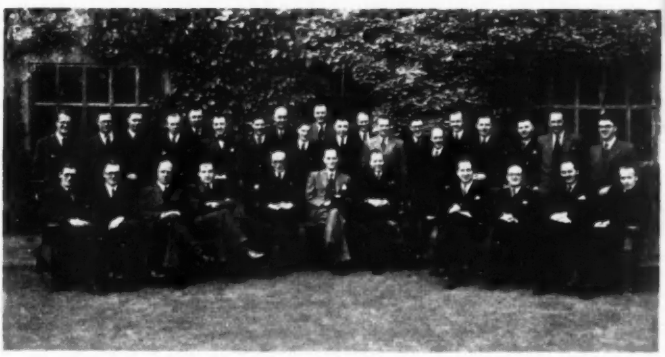
SOME errors have recently been discovered in the notes on the B.E.A. third annual report which appeared in our issue of October 18. On page 692 the increase in expenditure on training, safety and welfare was incorrectly given as £900,000, whereas the correct figure is £290,000. Further, in the editorial comment on the report, it is implied that the surplus of £6·3 million for the year is slightly down on the previous year because of allocations to taxation reserve. In fact, the surplus is arrived at before considering amounts set aside to reserves.

As Charming as Ever

WE are indebted to Metropolitan-Vickers Electrical Co., Ltd. for another attractive calendar to span the following 12 months. The company, as in the past, has departed from normal practice, by producing their calendar to run from October to September next. All who are as fortunate as ourselves in obtaining copies will no doubt agree that the 1951-52 "Metrovick Lady" depicted is as charming as ever.

Street Lighting Allegation

AT a meeting of the Association of Municipal Corporations last week, it was suggested that the Ministry of Transport was attempting to take away the right of local authorities to choose their own street lighting. It was the responsibility of the council but Ministry approval was essential under Defence Regulations. A delegate cited an instance where approval had been withheld over a scheme to convert street lighting from gas to electricity. Representations are to be made to the Ministry on this matter, it was stated.



Representatives with Head Office executives photographed at one of the social functions during the Midland Electric Manufacturing Co.'s 1951 sales conference

NEWS IN BRIEF

In our last issue, on page 740, it was stated that Willans and Robinson had, at the beginning of 1914, paid no ordinary dividends since 1900. This should have read since 1909.

"Electricity" will be the subject of the first of a series of Progress Reports in the B.B.C.'s N. of England Home Service at 7.40 p.m. tomorrow (Friday). Two N.W. Division chief officers, Mr. J. L. Ashworth and Mr. J. R. Thompson will discuss the subject with Mr. Oliver Howarth, N.W. Board's chief engineer.

Annual Court of Governors of the Commercial Travellers' Benevolent Institution will take place at Berners Hotel, Berners Street, W.1, on December 28.

Current exhibition at the Engineering Centre in Sauchiehall Street, Glasgow, is "The Story of the Amateur Radio." Opened last Monday it continues until November 3.

The third National Packaging Exhibition is to be held at Olympia between January 20 and 30, 1953.

Members of the Institute of Metals spent a day touring the Greenwich works of Telegraph Construction and Maintenance Co., Ltd., recently. Some 30 members were in the party.

A small booklet giving details of the Board and its districts has been published by the S. Wales Electricity Board. It is a second edition.

Visits to the 1951 Building Exhibition which have been arranged so far, include those of the Council of I.E.E. on November 16, and the Institute of Heating and Ventilating Engineers on November 20.

Tickets for the annual ball in aid of E.I.B.A. funds, to be held in Manchester on December 7, are available at £2 5s. from Claude Brookes, Salford Electrical Instruments Ltd., Peel Works, Silk Street, Salford 3.

The Player's section of Ekco Social and Sports Club are presenting a comedy entitled "The Young Mrs. Barrington" in their new works theatre during next week.

Wartime utility frontage of the Castle Bromwich section of B.I.F. is to be scrapped and a new permanent design will be erected for the 1952 Fair.

Electric Supply News

Belfast

The city electrical engineer, last week, submitted a report on works connected with the development of Victoria power station. The estimated cost of carrying out the work is £1,025,000.

Herefordshire

As a temporary measure, the Minister of Fuel and Power has agreed to allow the Midlands Electricity Board to erect an overhead power line across the Malvern Hills. But that part over the saddle of the hills is to be changed to underground within the next 12 months. This amendment has resulted from representations by the Board that reinforcement of the supply to Herefordshire was urgently needed, but to conform to the original consent (using part underground cable) would delay the scheme till next year because of the shortage of necessary cable. The Board stressed that at present there is only one line from Stourport into Herefordshire and if there should be a breakdown it would deprive 75% of the consumers of their supply.

Kirkcaldy

A bold approach to the question of providing electricity supplies to new housing estates was taken by Kirkcaldy Housing Committee recently when it was decided to accept a sub-committee's recommendation that the South-East Scotland Electricity Board be permitted to utilise trenches excavated for water mains for the purpose of laying electric cables. The Board had pointed out that with restriction on capital expenditure they were faced with the necessity of having to consider providing supplies by o.h. cables. Quoting Valley Gardens as an example, they showed that to supply by underground cable would cost £19,745, and by o.h. line £9,444. The Board felt that housing authorities would not favour o.h. cables in their housing schemes, and as an alternative suggested that where water trenches were cut they be allowed to put their mains in the same track as the water mains, and that where the tracks could not be coincidental, the council, at its own expense, should excavate the necessary tracks for the Board. These proposals were agreed to on the understanding that the track which had been cut for water purposes would be left open for a reasonable time only.

Northumberland

The County Education Committee has asked the County Councils' Association and the Association of Education Committees to take up the question of charges for electricity services at educational premises. Recently the Northumberland authority decided to pay "under protest" a £2,100 bill from the Electricity Board for electric services. Mr. H. M. Spink, Director of Education for the county, stated that electricity costs were "staggering" compared with pre-nationalisation days. It seemed to be a case of unloading charges on to the local authorities, he alleged.

North of Scotland

Consumers in the Cowal district of Argyllshire and on the islands of Bute and Great Cumbrae are to pay less for their electricity. Because they are now supplied with power produced by the North of Scotland Hydro-Electric Board's new Cowal hydro-electric scheme, they are to go on to the Board's cheaper water power tariff, as from their next meter reading. The lower rates will not apply to the Island of Arran, where the supply will continue to be provided mainly from diesel generating plant.

LIGHTING SCHEMES

Cardiff.—T.C. is recommended to approve the erection of 84 street lamps at Crystals No. 2 site, at an estimated cost, £2,500.

Launceston T.C.—The divisional road engineer of the M.o.T. has made proposals for amendments to the revised scheme for street lighting. To most of these the corporation has agreed, while again insisting on conversion of gas lamps to electricity.

March (Isle of Ely).—U.D.C. has received Ministry's approval of a street lighting scheme to cost £4,745.

Middlesbrough.—T.C. seeking M.o.T. approval of £2,040 scheme for sodium lighting, with d.c. bias control, in a section of Marton Road.

Norwich.—The T.C. has agreed to provide lighting in Farrow and Guardian Roads at a cost of £1,860.

Padiham (Lancs).—U.D.C.—Application being made for sanction to borrow £1,020 for erection of 20 sodium lamp standards in Slade Lane.

Peterborough.—Highways Committee has approved schemes submitted by Eastern Electricity Board for improving lighting in certain streets at a cost of £4,650.

Prescot (Lancs).—M.o.T. has given preliminary approval to improved lighting on the trunk road, at cost of over £3,000.

Ramsgate.—T.C. recommended to approve in principle the conversion of lighting of major roads in the borough to electricity, at an estimated cost of £27,548.

Southgate.—The Borough Engineer has discussed with the divisional senior public lighting officer of the M.o.T. the question of conversion from gas to electricity for street lighting in the borough. The Highways Committee has agreed to sodium lighting on the North Circular Road within the borough.

Stalybridge.—T.C. received Ministry consent to borrowing of £1,280 for providing Class A lighting in Clarence Street.

Stockport.—Conversion of street lighting on Woodbank Estate, from gas to electricity, will cost £3,136, it is estimated.

Company Activities

H. J. Baldwin

The final Ordinary dividend is 15% again making 25% for the year to March 31 last, although the final is payable on the increased capital. Trading profit for the year, including rent and royalties, amounted to £36,073 (*£42,024*), plus income from subsidiaries £9,013 (*nil*), investment income £6,754 (*£3,901*), making a total of £51,840 (*£54,488*). Taxation absorbs £22,688 (*£22,959*), and depreciation £5,771 (*£5,577*), leaving a net profit of £23,066 (*£25,637*). There is £29,235 (*£26,700*) carried forward. The directors also announce that a new issue of capital is planned. Creation of a further 100,000 6% £1 Cumulative Preference shares and 500,000 2s. Ordinary shares is contemplated. If the proposals are approved, it is intended to offer the whole of the new Preference to existing Preference and Ordinary holders early next year. There is no present intention, it is stated, regarding the proposed additional Ordinary capital.

British Electric Transformer Co.

Final Ordinary of 2s. 5d. per 5s. share, is recommended, as against 3s. 10d. per share on a smaller capital in the previous year. After charging depreciation, taxation and provisions, the net profit for the year to June 30 was £43,789 (*£68,861*). In addition to the foregoing, taxation amounting to £15,000 (*nil*) has become recoverable in respect of the allowance for industrial buildings and the directors have decided to recommend its distribution by the payment of a special dividend on the Ordinary of 6d. per share free of tax.

Calcutta Tramways Co.

At December 31 last, total assets of the company amounted to £3,336,895 (*£3,320,413*). Current assets totalled £938,660 as against £942,771 for the previous year, and current liabilities £227,947 (*£206,381*). Outstanding commitments for uncompleted contracts for capital expenditure was estimated at £137,000 (*£260,000*). Stocks in hand stand at £405,347 (*£285,733*), the increase being substantially represented by the purchase of components for the new tramcars. As and when these new cars come into service during the current year, the value of these components will be capitalised.

Crabtree Electrical Industries Ltd.

Group trading profit, plus other income, for the year to July 31 last amounted to £461,310 as against £370,953 for the previous twelve months. There is a final Ordinary dividend of 12½%, again making 17½% for the year. Taxation absorbs £249,346 (*£180,387*), to depreciation £34,498 (*£31,904*), directors' emoluments £22,482 (*£18,469*), patents £3,901 (*£3,071*), and audit fee £1,173 (*£1,166*), leaving a group profit of £149,910 (*£135,956*). Income tax free dividends totalling £80,000 (*£70,000*) have been received by the company from its subsidiaries. Preference dividends take £9,406 and Ordinary dividends £55,875.

Crompton Parkinson, Ltd.

There is again to be a final Ordinary dividend of 3¾%, plus cash bonus of 3¾%. The net income taken to account by Crompton Parkinson, Ltd., for the year ended June 30, after charging depreciation, taxation and provisions was £489,245 (*£491,335*). The group consolidated net income for the year was £550,128 after charging depreciation, taxation and provisions (*£560,710*). In addition to the foregoing, provisions no longer required and profits relating to previous periods amounted to £63,249 (*£109,500*). The directors also recommend the payment of £10,000 (*£5,000*) to the trustees of the benevolent fund.

East African Power and Lighting Co.

The prospectus is to be advertised tomorrow, November 2, for the issue of additional 1,000,000 Ordinary shares of 20s. each, at a price of 32s.6d., to which the chairman, Mr. C. M. Taylor, referred at the meeting last month. A minimum of one-third of the shares will be made available to meet applications from East Africa.

Eastwoods Ltd.

Group trading profit for the year to March 31 last, after charging £21,372 directors' remunera- last, after charging £21,372 directors' emoluments, etc., amounts to £433,241 (*£371,011*). After deducting debenture interest, audit fee, depreciation, amortisation of property, there is a balance of £282,935 (*£228,555*). Adding investment income, and charging taxation of £170,285 (*£142,917*), the group net profit is £121,729 (*£97,450*).

Morphy-Richards Ltd.

The full accounts for the year ended June 30 last show a group balance carried forward of £75,725 (*£29,168*). Consolidated current assets are listed at £615,495 (*£572,387*), and current liabilities £308,677 (*£353,654*). The group sales again showed an increase of 50% above the previous year. In regard to the erection of a new factory at St. Mary Cray, to add about 60,000 sq ft to production space, Mr. G. Wansbrough, chairman, explains that arrangements have been made by which the site has been taken over by a building firm who will build the factory to be leased to Morphy-Richards for a moderate rental with an option to buy during the next 15 years. It was hoped to complete the factory within the next twelve months.

Dividends Declared

Anglo-Portuguese Telephone Co.—Interim dividend of 3% (*same*).

B. and F. Carter, Ltd.—Dividend of 12½% plus bonus 5% (*same*). Profit for year to July 31, £14,036 (*£14,544*.

Electric and Musical Industries.—Final Ordinary dividend 4%, making 12% (8%).

Newman and Hender, Ltd.—Interim dividend of 5% (*same*).

Stream-Line Filters, Ltd.—Interim dividend of 5% (*same*).

Commercial Information

CONTRACTS OPEN

HOME

Nov. 2.—Billingham U.D.C. Street lighting included in works on Roseberry Rd. development scheme. Eric G. Lediard, chartered civil engineer, 4 Eldon Sq., Newcastle-on-Tyne. Deposit £5 5s.

Nov. 2.—Edinburgh. Renewal of lighting and power installation at Education offices in St. Giles St. City Architect, City Chambers.

Nov. 3.—Longbenton U.D.C. Electrical installation in 16 houses at Benton (contract 26) and 10 bungalows at Annitsford (contract 27). A. E. Sweetman, Engineer and Surveyor, Council Offices, Forest Hall, Newcastle-on-Tyne. Deposit £2 2s.

Nov. 3.—Peterborough. Lighting and power installations to 14 shops, branch library, 16 flats, 14 garages and stores on Dogsthorpe estate. Applications by above date to F. J. Smith, City Engineer and Surveyor, Town Hall. Deposit £2 2s. (See October 25 issue.)

Nov. 5.—Dewsbury T.C. Electrical work in proposed occupation centre at Savile Town. Borough Architect and Buildings Surveyor, Town Hall.

Nov. 5.—Downpatrick (Co. Down) U.D.C. Electrical installation in 18 houses in course of erection. T. M'Clean, architect, Irish Street.

Nov. 5.—St. Helens T.C. Supply and erection of (a) 39 concrete columns with 80 W HPMV lanterns on Cecil St. estate; and (b) 28 concrete columns with 125 W HPMV lanterns and 16 concrete columns with 80 W HPMV lanterns in Parade St. area. M. Ward, Borough Engineer, Town Hall.

Nov. 5.—Hull. Electrical installation at Lambert St. school. City Architect, Guildhall. Deposit £1 1s.

Nov. 6.—Aberdeen. Electrical work in alterations and additions to Oyne school. Tawse and Allan, architects, 343 Union St.

Nov. 6.—Derby T.C. Supply, erection and installation of Group A sodium discharge lighting along Queensway, trunk road A.5111. Borough Engineer and Surveyor, Council House. (See October 18 issue.)

Nov. 6.—Southport T.C. Conversion from gas to electricity in 182 houses on Essex Rd. estate. Borough Architect and Town Planning Officer, Pavilion Buildings, Lord Street.

Nov. 7.—Sutherland. Electrical work in erection of 42 houses on various sites. Architect is E. W. Brannen, Carnegie Buildings, Dornoch. Deposit £1 1s.

Nov. 8.—Littlehampton U.D.C. Wiring to electric lighting and power points in 16 maisonettes. Engineer and Surveyor, Council Offices. Deposit £1 1s.

Nov. 9.—Bingley U.D.C. Tenders invited for (a) supply, erection and installation of 18 concrete lighting columns, lanterns and auxiliary equipment in Mornington Rd., and (b) erection and conversion of gas lighting columns and supply, erection and installation of 17 swan-neck brackets, lanterns and auxiliary equipment in Chapel Lane and Dubb Lane. J. S. Lattin, Engineer and Surveyor, Town Hall. Deposit £2 2s. in respect of each scheme. (See Oct. 4 issue)

Nov. 10.—Dublin. Wiring for standby power plant at Shannon airport. Consulting Engineer is J. V. Tierney, 15-16 Duke St. Deposit £3.

Nov. 13. — Ince-in-Makerfield U.D.C. Electrical installations in 40 houses on Battersby St. site. Surveyor, R. Lewis, Town Hall, Ince, Nr. Wigan. Deposit £1 1s.

Nov. 14.—N. Ireland. Electric lamps and other requisites are included among supplies required by Lagan Valley and Lisburn Hospitals during year beginning Jan. 1, 1952. Secretary, S. Antrim Hospital Management Committee, Dublin Rd., Lisburn.

Nov. 15.—Manchester. Electrical installation at Hall Lane police station. Wythenshawe. City Architect, Town Hall. Deposit £1 1s.

Nov. 15.—Ashford (Kent) U.D.C. Erection of 32 class B concrete street lighting columns and lanterns. Surveyor, 5 North St. Deposit £1 1s.

Nov. 16.—West Hartlepool T.C. Electrical installation in old people's hostel in Station Lane. Borough Architect, Municipal Buildings.

Nov. 17.—Windsor T.C. Supply of electric lamps, fittings and cable during year ending Dec. 31, 1952. G. S. Baker, Borough Engineer, Kipling Memorial Building, Alma Rd.

Nov. 19.—Southport T.C. Tenders invited for (a) supply and laying of approx. 1,150 yd of cable suitable for 39 kW on 3-phase neutral system for pier illuminations, with fuses, tapping points, etc., or (b) supply of cable. Particulars from Publicity and Attractions Dept., Town Hall. (Advertised in this issue).

Nov. 21. — Formby (Lancs) U.D.C. Supply of concrete street lamp columns required during year ending Dec. 31, 1952. Engineer and Surveyor, Council Offices.

Nov. 23.—Belfast. Supply and erection of (a) two 48 in. bore and two 72 in. bore motor operated sluice valves for condenser circulating water culverts; and (b) seven penstocks 5 ft. by 10 ft., three 3 ft. by 13 ft. and one 6 ft. by 13 ft. motor operated with emergency hand operating gear. Also one road transport weighbridge capable of weighing up to 30 tons and with indicating and ticket printing recording equipment. All for Electricity Dept. Merz and McLellan, consulting engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. (See October 25 issue.)

Nov. 24.—Glyncorrwg U.D.C. Wiring of 86 houses at Cymmer. Engineer and Surveyor, T. J. Walker, Council Offices, Cymmer. Deposit £1 1s.

Nov. 26.—Gateshead T.C. Electrical installation in Southend Rd. junior school. Applications by Nov. 8 to H. J. Cook, Chief Architect, Swinburne St., Gateshead. Deposit £2 2s. (Advertised in this issue.)

Nov. 30.—Salford. Supply of one 25-ft. 3-section motor tower wagon mounted on ¾-ton Karrier C.K.3 low-loading chassis. Street Lighting Superintendent, Bloom St., Salford 3. (See October 18 issue.)

Dec. 7.—Belfast. Supply and erection of low pressure piping installation, including valves, auxiliary pumps, tanks, water softening plant, air compressor and associated equipment. Merz and McLellan, Consulting Engineers, Carliol House, Newcastle-on-Tyne. Deposit £5 5s. (See October 18 issue.)

Dec. 12.—Monmouthshire. Eastern Valleys joint sewerage board invites tenders for eight sets of electrically driven vertical pumps with ancillary equipment. John Taylor and Sons, Artillery House, Westminster, S.W.1. Deposit £5.

Dec. 17.—Rugby T.C. Four sets of electrically driven vertical propeller pumps and two electrically driven vertical sludge pumps and ancillary equipment. Engineers, John Taylor and Sons Artillery House, Victoria St., S.W.1. Deposit £5.

Feb. 1, 1952.—Ireland. Supply and erection of hydro-electric generating plant at Inniscarra and Carrigadroid stations on River Lee. Documents from Chief Generation Engineer, Electricity Supply Board, 27 Lower Fitzwilliam St., Dublin C.18. Deposit £5 5s. (Advertised in this issue.)

No date stated.—Cumnock and Holmhead T.C. Electrical work in erection of 16 houses, on Drumbrochan site. R. D. Hunter, Town Clerk, Cumnock.

No dates stated.—Midlothian. Electrical work in erection of blocks of 4 shops with accommodation above on three sites; County Architect, 32 Palmerston Place, Edinburgh 2. Also same in reconstruction of wards at Rosslynlee Mental Hospital; Secretary Rosslynlee and Haddington Mental Hospitals Board of Management, 21 Hill St., Edinburgh 2. (Separate contracts.)

OVERSEAS

*Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.*

Nov. 12.—Auckland (N.Z.) Electric Power Board invites tenders for 12,000 yd of three core paper insulated cable with oval conductors. Tenders to chairman of Board, Queen St., B.o.T. (Ref. CRE (IB) 73454/51).*

Nov. 14.—Pakistan. Supply and erection of two 25 kVA diesel oil engine driven direct coupled alternator sets, 400/440 V, 3-phase, 4-wire, 50 c/s with exciter, auxiliaries and switchgear. Dept. of Supply and Development, Frere Rd., Karachi. B.o.T. (Ref. CRE (IB) 73773/51).*

Nov. 21.—Wellington (N.Z.) Director-General (Stores Division), G.P.O., requires 250V glass cartridge fuses, fuse holders and voltmeters. B.o.T. (Ref. CRE (IB) 73390/51).*

Nov. 28.—New South Wales. Dept. of Railways invites tenders for supply of indoor metal-clad switchgear unit (2,200 V-64) and associated equipment. Documents available from Agent-General for N.S.W., 56 Strand, London, W.C.2.

Dec. 12.—Portugal. Supply and erection of electro-mechanical equipment for Campilhas hydro-electric power station. Directorate General of Hydraulic Services, Rua de S. Mamede ao Caldas 23, Lisbon. B.o.T. (Ref. CRE (IB) 73394/51).*

Dec. 13.—India. Supply of six 8,000kVA 22,000/6,500V transformers with automatic on-load voltage regulating gear and associated switchgear. Chief Storekeeper, Electric House, Fort, Bombay. B.o.T. (Ref. CRE (IB) 73420/51).*

Jan. 15, 1952.—India. Tenders for assessment of cost of preliminary surveys and preparation in supply and erection of construction plant for the Bhakra Dam. Tenders for final erection of plant required by July 15, 1952. Directorate-General of Supplies and Disposals, Shahjahan Rd., New Delhi. B.o.T. (Ref. CRE(IB) 68266/51).*

Jan. 16, 1952.—S. Rhodesia. Supply of one 11 kV high pressure turbo-alternator for most economical rating of 16,000 kW and maximum continuous rating of 20,000 kW, etc., for Umniati B power station. Elect. Supply Commission, P.O. Box 377, Salisbury. B.o.T.*

CONTRACTS PLACED

Bexley T.C. Street lighting improvements in three streets, Revo Electric Co., Ltd., £3,852.

Dudley T.C. Installation of electricity in further 289 houses, Goldsmith and Cantrill, £6,493.

Edmonton T.C. Installation of electricity in flats on Flamstead End estate, Holmes and Larkinson, £3,070.

Hendon. Electrical installation in 48 flats at Edgware, Eastern Electricity Board, £1,461.

Hull. Electrical work at proposed Home in Thornton St., T. A. Garness Ltd., £1,451.

Islington. Improvements to side-street lighting, Metropolitan-Vickers Electrical Co. Ltd., £3,925.

Kensington. Supply of suspended lanterns for Ladbroke Grove and ornamental bracket arms for Brompton Rd., General Electric Co., £1,274 and £1,600 respectively.

Stepney B.C. Electrical installation in 77 flats, W. Simmons and Co. (Stratford) Ltd., £4,022.

Your Queries — Answered

Motor protection thermostats, makers of? J.N.—Otter Controls Ltd., Market St., Buxton. (21796)

"Burgoyne" solder guns, address for spares? M.A.—G. A. Walsh, 127 Sloane St., S.W.1; D. Cohen, 67 Raleigh Ave., Hayes, Middx. (21804)

"A.B.C. Spinner" washing machine, repairers of? P.C.—Try Canadian Electric Washing Machine Co. (Gt. B.), 45 South End, Croydon, Surrey, and Metalcraft Mfg. Co. (Canada), Ltd., 72 Newman St., London W.1. (21834)

"R.E.S." irons, makers of? T.E.—Telefridge Service 193, Mare St., Hackney, E.8. (21816)

"Duocold" refrigerators, makers of? L.E.—Deepfreeze Refrigeration Ltd., 193 Baslow Rd., Totley, Sheffield. (21827)

The above are selected from questions we have answered this week. If you have a query, send it to us.

ANSWER WANTED

Combined lighting fitting, heater and fan which will fit between ceiling joists, makers of? F.H. (21842)

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London, W.C.2.

Bailey Electrical Ltd. 24a Booth St., Ashton-under-Lyne. Manufacturers of and dealers in artificial lighting apparatus, electrical plant, etc. Nom. cap.: £3,000. Dirs.: K. Bailey and J. Hall.

B.H.J. Electrical and Refrigeration (Cardiff) Ltd. 20 Ninian Park Rd., Cardiff. Nom. cap.: £1,000. Permt. dirs.: J. Harley, R. L. Burchell and C. James.

Cross Signs Ltd. Sign makers and writers, etc. Nom. cap.: £1,000. Dirs.: S. F. Cross and Winifred G. Cross, addresses not stated. Subs.: G. A. Crook, 43 Beresford Rd., N.8., and Emily Faulkner, 15-17 Chichester Rents, Chancery Lane, W.C.2.

Horton, Goodchild and Co. Ltd. 31 Tonbridge Rd., Maidstone. Electrical engineers and contractors, etc. Nom. cap.: £1,000. Dirs.: J. A. Horton, H. R. P. Boorman and Winifred A. Goodchild.

Weston Engineering Co., Ltd. 93 Grays Inn Rd., W.C.1. Mechanical and general engineers, electricians, etc. Nom. cap.: £100. Dirs.: J. J. V. Medina, F. J. Constable and S. Maule.

TRADE NOTES

Repair Service. Dowding and Mills Ltd., industrial, electrical and mechanical repair specialists, have extended their "day and night service" to London, by opening up a branch office at 24-26 Whitepost Lane, Hackney E.9 (Tel.: AMHerst 3119) and Works at 21-23 Rothbury Road, Hackney E.9. The manager is Mr. H. Wharmby.

Changes of Address. On and after Monday, December 3, the address of The Building Centre will be Store Street, Tottenham Court Road, London W.C.1. Tel.: Museum 5400.

About the middle of November, the head office address of Ekco-Ensign Ltd. will be at 45 Essex Street, Strand, London, W.C.2.

Australian Duties. In recent amendments to the Australian Customs and Excise tariff, magnet winding wire carries a duty of 10% under the British Preferential tariff. The most favour-nation duty is 22½% and the general 30%. Torch cases to take not more than two dry cells, now carry duties of 10%, 55% and 55% respectively.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York pr e
COPPER, electrolytic	227 0 0	£220 0 0
LEAD, good soft pig (foreign)	175 0 0	152 0 0
" " " "English" quality	176 10 0	
Tin (99·99·75%) ... ...(Cash)	1005-1010	—
" (3 months)	982½-987½	—
ALUMINIUM, commercial purity (del.)	124 0 0	—
ZINC	190 0 0	156 0 0
ARMOURING:		
Galv. Steel Wire (0·104 in.)	55 5 0	—
Mild Steel Tape (0·04 in.)	32 5 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

G. Salter Ltd., electrical contractors of Ellesmere Port, Cheshire, have appointed A. A. Johnstone, Post Office Chambers, Ellesmere Port, as liquidator.

C.M.C. (Switchmatic) Ltd. Meeting of creditors was held at 53 Dyke Rd., Brighton, last Monday (Oct. 29).

Tufcan Electrical Industries Ltd. Meetings of members and creditors to be held at offices of Harry L. Price & Co., 47 Mosley St., Manchester 2, on Dec. 7 at 11 and 11.30 a.m. respectively to receive liquidator's report.

Solar Electric Co. Ltd. Creditors are asked to send particulars to Victor A. D. Kent, of J. Hulbert Grove and Co., 9 Cavendish Sq., W.1, the liquidator, by Nov. 12.

Southdown Refrigeration and Equipment Co. Ltd. Meetings of members and creditors will be held at 100 Park St., Grosvenor Sq., W.1, on Nov. 23 at 2.15 and 2.30 p.m. respectively, to receive liquidator's report.

Dividends

Luton. Electrical and Car Services (Luton) Ltd., electrical and motor engineers. First and final dividends of 7s 7d in £ payable at 66 Alma St., Luton, on Nov. 5.

Voluntary Liquidation

Hyde, Howard and Co. Ltd., 6 Piccadilly, York, electrical engineers. At meeting of creditors statement of affairs presented showing liabilities amounting to £7,330. Assets estimated to produce £3,078 and after allowing £230 for preferential claims, there were net assets of £2,847, or deficiency as regarded creditors of £4,482. Issued capital amounted to £6,350, and so far as the members were concerned, there was total deficiency of £10,832. After discussing the position, a resolution was passed for appointment of Mr. G. A. Atkinson, accountant, of York, as liquidator, with a committee of inspection.

BANKRUPTCY ACTS

First Meeting

London. Frederick Phillips, electrical contractor, trading as "F. Phillips and Son" at 28 Blenheim Terrace, N.W.8. Meeting to be held at Bankruptcy Buildings, Carey St., W.C.2, today Thursday at 2.30 p.m. and public examination at same address on Dec. 7 at 11 a.m.

Public Examination

Newcastle-on-Tyne. Victor C. Phillips, trading as manufacturer or wholesaler of radios at 56 Low Friar St., Newcastle. Public examination at the Court House, 56 Westgate Rd., on Dec. 4 at 10.30 a.m. (First meeting was on Oct. 30.)

Intended Dividend

London. Harold J. A. Wade and Clara L. Wade, electrical engineers and contractors, trading as "C. and H. Wade and Co." at 40 Dulwich Rd., S.E.24, and lately at 68 Brixton Water Lane, S.W.2. Last day for receiving proofs, Nov. 6. Trustee is W. F. Cresswell, Snr. Official Receiver, Bankruptcy Buildings, Carey St., W.C.2.

Dividend

Liverpool. John Manley, radio dealer and engineer trading at 457-9 Stanley Rd., Bootle. First and final dividends of 3d. in £ payable on Nov. 2 at office of Trustee, S. Oliver Henry, 5 Rumford Place, Liverpool 3.

Notice has been given that the following names of companies have been struck off the Register: Broadheath Electrical Co., Ltd.; Electradio Services, Ltd.; & Middlesex Electron Co., Ltd.

BUSINESS PROSPECTS

HOME

Ashton-under-Lyne T.C. Erection of 178 houses on the Taunton estate. A. T. Kemp, Architect to Council, Municipal Offices.

Aylesbury T.C. Plans prepared for 52 houses and 6 flats in Buckingham Rd.

Basingstoke. Lansing Bagnall Ltd. are planning extension to their factory in Kingsclere Rd.

Basford (Notts) R.D.C. Erection of 250 houses at Ruddington, Kimberley and Nuthall. Council's Engineer, Surveyor and Housing Architect, J. J. Ellis, Rock House, Basford.

Bath. Erection of phase 2 of Tiverton junior and infants' school. W. E. Underwood and Sons, Quantity Surveyors, 21 Gay St.

Bedlington U.D.C. Plans approved for erection of 160 houses in Stead Lane.

Billingham-on-Tees U.D.C. Plans for installation of fluorescent lighting in Council Offices under consideration.

Birmingham. It is proposed to build a £42,927 sub-divisional police station at Sheldon.

Brentford. Trico-Folberth, Ltd., Great West Rd., propose to carry out extensions to their existing premises. Architect is H. St. John Harrison, 1 Babmaes St., S.W.1.

Brighouse T.C. Forty flats in ten blocks proposed for Field Lane site, Rastrick.

Burton-on-Trent T.C. Tenders to be invited for erection of a further 79 houses on Manners estate, Winshill.

Carmarthenshire. Construction of junior and infants' school at Llannon. W. T. Lloyd, County Architect, County Hall, Carmarthen.

Chepstow (Mon.) R.D.C. Erection approved of 224 houses at Caldicot.

Colchester T.C. Plans approved for erection of 117 houses and flats on part of Shrub End site.

East Sussex. Plans approved for secondary modern schools at Crowborough and Robertsbridge.

Cumberland. First part of proposed secondary school costing £79,000 is to be carried out next year. Cost of whole school is estimated at £179,000. County Architect is J. H. Hangham.

Darlaston (Staffs) U.D.C. Application to be made for sanction to borrow £89,510 for erection of 66 houses at Bentley.

Dewsbury T.C. Site for 232 houses has been approved in Wakefield Rd.

Dublin. Construction of 154 houses, 32 maisonettes and 12 shops in Finglas housing area. City Treasurer, Exchange Buildings, Lord Edward St.

Enfield U.D.C. Erection of 30 houses in Addison Rd., and shops and flats in Enfield Rd. Engineer and Surveyor, Frank Lee, 7 Little Park Gardens.

Glasgow. Plans prepared for proposed development at Garthamlock which provides for 2,100 dwellings in houses, flats, shops and maisonettes. In addition the plan shows 2 churches, 2 shopping centres, fire station, community centre, etc.

Guernsey. Building of 48 houses Le Valnord, St. Peter Port. States Engineer, States Office Annexe, Albert Pier, St. Peter Port.

Halifax T.C. Erection of 72 flats, 26 bungalows and 14 houses at Willowfield. Geoffrey Holden, Borough Engineer, Crossley St.

Hastings. It is proposed to build a block of 3 shops, 6 flats and 6 maisonettes on Hollingbury estate. Estimated cost, £32,000.

Hemsworth U.D.C. Erection of 40 bungalows on Moorshutt Rd. estate. Council's Architects, Pennington, Hustler and Taylor, 45 Ropersgate, Pontefract.

Knaresborough U.D.C. Construction of 62 houses on Meadowside estate. Engineer and Surveyor, Knaresborough House.

Longbenton U.D.C. Tenders being obtained for erection of 18 houses and 12 bungalows at Holystone.

Malton U.D.C. Construction of 28 houses on Peasey Hills Rd. site. Guy D. Channon, Council's Architect, Market St.

Manchester. Application to be made for sanction to borrow £45,898 for erection of 32 houses at Blackley, and £39,428 for 28 houses at Wythenshawe.

Margotsfield (Bristol) U.D.C. Erection of 34 houses on Hillhouse estate. Surveyor is at Council Offices, Staple Hill, Bristol.

Pontefract C.C. recommended to approve installation of electric lighting at Willow Park school. Estimated cost is £1,100.

Prestwich T.C. Construction of 72 houses on Carr Clough estate. Borough Engineer, Town Hall.

Ramsgate T.C. Tenders expected to be invited shortly for internal wiring of houses on West Dumpton estate.

Warrington R.D.C. Erection of 67 houses on three estates. Council's Engineer and Surveyor, S.C. Oxley, Council Offices, Museum Street.

Whitley Bay U.D.C. Scheme approved for 80 houses at Secton Sluice. Surveyor is E. Roberts, Council Offices.

OVERSEAS

Canada. Chadwick-Carroll Brass and Fixtures Ltd., 365 Wilson St., Hamilton, Ontario, want to purchase from or represent as agent U.K. manufacturers of electrical domestic appliances for 110V, 60 and 25c/s, and porcelained electric light reflectors. Interested firms should contact W. W. Chadwick, president and general manager, direct.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Pluto. 689,980. Class 11. Electric lamp bulbs. Christie and Sadler, Ltd., Pluto House, 68 Finsbury Pavement, E.C.2.

Red Rose. 699,199. Class 9. Portable electric appliances. G. K. Lancaster (London) Ltd., 50 George St., Croydon, Surrey.

Testudo. 700,450. Class 17. Insulating varnish. British Cellulose Lacquers, Ltd., 94 Old Broad St., E.C.2.

Wair. B698,700. Class 9. Electrically operated advertising signs, bells and buzzers, etc. J. Lyons and Co., Ltd., Cadby Hall, W.14.

Wincord. 695,473. Class 9. Insulated clips and devices incorporating an insulated clip. Asmidar, Ltd., 5 Rampayne St., S.W.1.

MEETINGS TO NOTE

THURSDAY, NOV. 1

A.S.E.E. (S. London Branch).—"Fluorescent Lighting". H. Windebank. Cafe Royal, North End, Croydon, 8 p.m.

I.E.E. (E. Midland Centre).—Dinner dance at George Hotel, Kettering, 8 p.m.

I.E.S. (Leicester Centre).—"Lighting for Schools." J. F. Roper. E. Midland Elect. Board, Charles St., 6.30 p.m.

I.E.S. (Nottingham Centre).—"Modern Airport Lighting." J. W. Morse. E. Midland Elect. Board, Smithy Row, 5.30 p.m.

I.E.S. (Exeter Group).—Ladies informal evening.

FRIDAY, NOV. 2

I.E.S. (Bath and Bristol Centre).—Ladies informal evening.

I.E.S. (Stoke-on-Trent Group).—"Stage Lighting." E. Faraday. 31 Kingsway, 6 p.m.

E.I.B.A. (Sussex Branch).—Annual dance at Assembly Hall, Worthing.

MANCHESTER ASSOC. OF ENGRS.—"Modern Methods of Sound Reproduction." J. R. G. Vernon. Engineers Club, Albert Sq., 6.45 p.m.

MONDAY, NOV. 5

A.S.E.E. (Leeds Branch).—"Electromechanical Aids to Radiological Technique." E. D. Ormerod, Gt. Northern Hotel, Wellington St., 7.30 p.m.

A.S.E.E. (N.E. London Branch).—"General Motor Control Gear." S. H. Harding. Angel Hotel, Ilford, 8 p.m.

A.S.E.E. (Sheffield Branch).—"Electric Discharge Lamps." A. E. Bird. Royal Victoria Station Hotel, 7.30 p.m.

JNR. INSTN. OF ENGINEERS (N.W. Section).—"Modern Electric Traction." J. K. Brown. 16 St. Mary's Parsonage, Manchester, 7.30 p.m.

I.E.E. (London Students Section).—"Power Station Practice." J. E. G. Silvester, and M. G. Nash. Savoy Place, 7 p.m.

I.E.E. (Mersey and N. Wales Centre).—"Life and Work of Oliver Heaviside." Prof. G. H. Rawcliffe. Royal Instn., Liverpool, 6.30 p.m.

I.E.E. (N.E. Radio and Measurements Group).—"Crystal Triodes." T. R. Scott. King's College, Newcastle, 6.15 p.m.

I.E.E. (S. Midland Centre).—"Economic Plant Sizes and Boiler-Set Groupings on British Grid." B. Donkin and P. H. Morgen. James Watt Inst., Birmingham, 6 p.m.

I.E.E. (N. Staffs sub-centre).—"Television." C. T. Lamping. P.O. Training School, Stone, 7 p.m.

TUESDAY, NOV. 6

A.S.E.E. (W. London Branch).—"Review of Soviet Industry Today." Windsor Castle Hotel, King St., Hammersmith, 7.30 p.m.

I.E.E. (London Measurements Section).—Discussion on "Measurements involved in Testing of Protective Equipment; introduced by H. S. Petch. Savoy Place, 5.30 p.m.

I.E.E. (E. Midland Centre).—"Development and Application of Vibrator as Competitor of Rotary Convertor." J. H. Mitchell, Loughborough College, 6.30 p.m.

I.E.E. (Cambridge Radio Group).—Chairman of Group's address by D. C. Espley. Cambridgeshire Tech. College, 6 p.m.

I.E.E. (N.W. Centre).—"Review of Research in Electricity Supply." C. W. Marshall. Engrs. Club, Albert Sq., Manchester, 6.15 p.m.

I.E.E. (Scottish Centre).—"Planning of Electricity Board's Distribution System." G. O. McLean. 39 Elmbank Crescent, Glasgow, 7 p.m.

I.E.E. (Rugby sub-centre).—"Continental Development of Single-Anode Mercury-Arc-Rectifier Valves of High Power." H. von Bertele. College of Technology and Arts, 6.30 p.m.

I.E.S. (Cardiff Centre).—"Lighting of Departmental Stores." L. E. Gibbs. S.Wales Elect. Board, 5.45 p.m.

BRITISH INSTN. OF RADIO ENGRS. (Scottish Section).—"Brain as a piece of Communication Equipment." H. W. Shipton. University College, Dundee, 7 p.m.

WEDNESDAY, NOV. 7

A.S.E.E. (York Branch).—"Flameproof Fittings." J. H. Mollan. Feasgate Restaurant, Feasgate, 7.30 p.m.

A.S.E.E. (N. London Branch).—"Modern Lift Practice." W. A. Dixie. Three Jolly Butchers Hotel, Wood Green, 8.15 p.m.

I.E.E. (Tees-Side sub-centre).—"Rectifier - Motor Variable - Speed Drives." P. Bingley. Cleveland Scientific and Technical Inst., Middlesbrough, 6.30 p.m.

I.E.E. (Sheffield sub-centre).—"L.T. Industrial Control Gear and its Applications." S. H. Harding. Tech. School, Scunthorpe, 7 p.m.

I.E.E. (Scottish Centre).—"Planning of Electricity Board's Distribution System." Heriot-Watt College, Edinburgh, 7 p.m.

I.E.E. (N.E. Scotland sub-centre).—"Evolution of Lighting Art." J. W. T. Walsh. Caledonian Hotel, Aberdeen, 7.30 p.m.

I.E.E. (Southern Centre).—"Electrical Control of Dangerous Machinery and Processes—Part 3." W. Fordham Cooper. Polygon Hotel, Southampton, 6.30 p.m.

I.E.S. (Edinburgh Centre).—"Sports Lighting—Indoor and Outdoor." D. E. Beard. 357 High St., 7 p.m.

I.E.S. (Newcastle Centre).—"Glass in the Service of Light." A. J. Holland. Minor Durrant Hall, Oxford St., 6.15 p.m.

BRITISH INSTN. OF RADIO ENGRS. (Scottish Section).—"The Brain as Communication Equipment." H. W. Shipton, The University, Edinburgh, 7 p.m.

INCORP. PLANT ENGRS. (Southampton Branch).—"Efficiency of Combined Heat and Power." A. C. Dunningham. Polygon Hotel, 7.30 p.m.

A.S.E.E. —"Fluorescent Lighting." J. W. Strange. College of Technology, Manchester 7.15 p.m.

THURSDAY, NOV. 8

A.S.E.E. (Bristol Branch).—"Fluorescent Lighting and the Maintenance Engineer." A. G. Mitchell. Grand Hotel, 7.30 p.m.

I.E.E. (London).—"London-Birmingham Television-cable System." T. Kilvington, F. J. M. Laver and H. Stanesby. Savoy Place, 5.30 p.m.

I.E.E. (E. Midland Centre).—"Deterioration of Mains Cables due to External Causes." P. W. Cave. District meeting at George Hotel, Kettering, 7 p.m.

I.E.E. (N.E. Scotland sub-centre).—"Evolution of Lighting Art.', J. W. T. Walsh. Royal Hotel, Dundee, 7 p.m.

I.E.E. (W. Wales sub-centre).—"Protection of Electrical Power Systems." H. Leyburn and C. H. W. Lackey. Plaza Cinema, Swansea, 6 p.m.

I.E.S. (Glasgow Centre).—"Indoor and Outdoor Sports Lighting." D. E. Beard. 39 Elmbank Crescent, 6.30 p.m.

I.E.S. (Manchester Centre).—"Hospital Lighting." D. J. Reed and M. W. Peirce. Town Hall Extension, 6 p.m.

ELECT. POWER ENGRS. ASSOC. (Merseyside Tech. Group).—"Power Station Lubrication." G. H. Clarke. Elect. Showroom, Whitechapel, Liverpool, 7 p.m.

BRITISH INSTN. OF RADIO ENGRS. (Scottish Section).—"The Brain as a piece of Communication Equipment." H. W. Shipton. Inst. of Engrs. and Shipbuilders, Glasgow, 7 p.m.

INCORP. PLANT ENGRS. (Newcastle Branch).—"Plant Engineer and the Factories Act." F. W. Thompson. Roadway House, Oxford St., 7.30 p.m.

FRIDAY, NOV. 9

A.S.E.E. (Crewe Branch).—"Electric Welding." W. Barnett. Crewe Arms Hotel, 7.30 p.m.

I.E.E. (Tees-Side sub-centre).—Annual dinner at Zetland Hotel, Saltburn-by-the-Sea.

I.E.S. (Birmingham Centre).—Ladies' Night at Imperial Hotel.

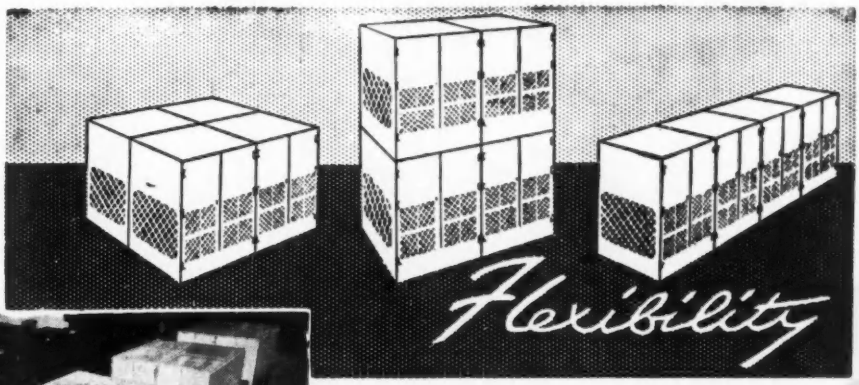
I.E.E. (N.E. Students' Section).—"Electronic Motor Control." C. R. Bates. King's College, Newcastle, 6.30 p.m.

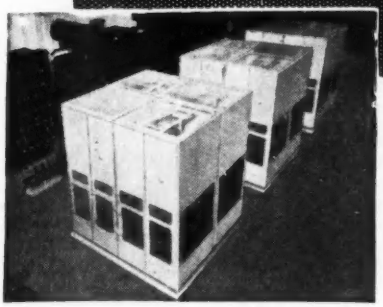
ELECTRICAL INDUSTRIES BALL in aid of E.I.B.A. Grosvenor House, Park Lane, W.1, 7 pm.

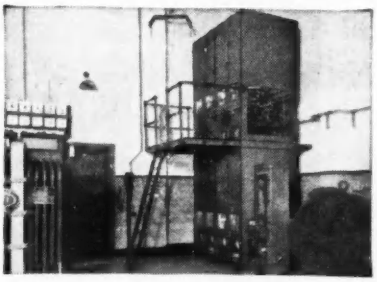
JNR. INSTN. OF ENGINEERS.—"The Engineer and Safety." F. M. Panzetta. 39 Victoria St., S.W.1, 6.30 p.m.

SOCIETY OF FRENCH CIVIL ENGINEERS; (British Section). —"Development of Hydraulic Power Production and H.T. Transmission in France." R. Brougniart. I.E.E. Lecture Hall, Savoy Place, 5.30 p.m.

E.P.E.A. (Southern Meter Engrs. Group).—"Use of C.R.O. to Meter and Test Engineers." O. H. Davies. Caxton Hall, S.W.1, 6.30 p.m.







FLEXIBILITY OF LAYOUT, due to their unit construction, makes Hewittic Rectifiers simplest and most reliable of all A.C. to D.C. converting plant, extremely adaptable to existing buildings or awkward sites. Note, on the left, some actual examples of this feature. Remember also that the division of total capacity into several units means not only a saving in building and installation costs (especially as crane facilities are not essential), but also the *highest efficiency*, due to lower arc drop with parallel operation; and increased reliability through not having "all one's eggs in one basket."

In fact, this unit construction and the simplicity of the individual units have much to do with the reputation for exceptional reliability long enjoyed by

Hewittic Rectifiers

REGD. TRADE MARK

OVER 1¼ MILLION kW IN WORLD-WIDE SERVICE

HACKBRIDGE AND HEWITTIC ELECTRIC CO. LTD., WALTON-ON-THAMES, SURREY

Telephone: Walton-on-Thames 760 (8 lines) Telegrams: "Electric," Walton-on-Thames

"A job to be proud of!"

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THE METALLIC SEAMLESS TUBE Co. Ltd., Ludgate Hill, BIRMINGHAM 3. Tel. CEN 7167

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CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. 0d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

ELECTRICITY SUPPLY BOARD, IRELAND

RIVER LEE DEVELOPMENT

THE Electricity Supply Board invites tenders for the supply, delivery and erection of:—

THE HYDRO-ELECTRIC GENERATING PLANT AT INNISCARRA AND CARRIGADROHID STATIONS ON THE RIVER LEE

Conditions of tendering, form of tender, conditions of contract and specification may be obtained from the Chief Generation Engineer, Electricity Supply Board, 27 Lower Fitzwilliam Street, Dublin, C.18, on payment of a fee of five guineas, which will be refunded on the receipt of a bona fide tender. Additional copies may be purchased at a cost of one guinea per copy (non-returnable).

Tenders with all the relevant documents enclosed in a sealed cover endorsed " River Lee Development : Tender for Hydro-Electric Generating Plant " must be delivered to the undersigned not later than twelve o'clock noon on Friday, February 1, 1952.

The Board does not bind itself to accept the lowest or any tender.

PATRICK J. DEMPSEY,
Secretary.

Electricity Supply Board,
27 Lower Fitzwilliam Street,
Dublin, C.18. (P 39)

COUNTY BOROUGH OF SOUTHPORT

THREE-PHASE CABLE—PIER ILLUMINATIONS

THE Council invite tenders for (*a*) the supplying and laying of approximately 1,150 yards of cable suitable for carrying a load of 39 kW on a three-phase neutral supply system for a scheme of illuminations, together with the fitting of fuses at the supply point and at the end, and including two tapping points at a one-third and two-thirds distance on the cable, or alternatively (*b*) for the supply and delivery of the cable only.

Further particulars may be obtained from the Publicity and Attractions Department, Town Hall.

Tenders endorsed "Pier Cable," which must state date of completion of work or date of delivery, must be delivered to the undersigned not later than 9 a.m. on November 19, 1951.

R. EDGAR PERRINS,
Town Clerk.

Town Hall, Southport.
October 23, 1951. (P 26)

COUNTY BOROUGH OF GATESHEAD

SOUTHEND ROAD JUNIOR SCHOOL

APPLICATIONS are invited from Contractors desirous of tendering for the ELECTRICAL INSTALLATION to the above, in accordance with the Scheme and Specification prepared by the consultants, Messrs. R. W. Gregory and Partners, Newcastle.

Copies of drawings and specification and form of tender may be obtained, the general conditions of contract inspected, at the office of the chief architect on deposit of two guineas, which will be refunded on receipt of a bona fide tender, and the return of the drawings and specification.

The contract for the above work will form a sub-contract to the main building contract, and the sub-contractor will be required to enter into a bond with the general contractor and the corporation.

Applications to tender should be made to H. J. Cook, A.R.I.B.A., M.I.Struct.E., Chief Architect, Swinburne Street, Gateshead, within seven days of this advertisement, and tenders returned on the official form in the endorsed envelope supplied, by noon on Monday, November 26, 1951.

The lowest or any tender will not necessarily be accepted.

J. W. PORTER,
Town Clerk.

Town Hall, Gateshead 8.
October 26, 1951. (P 40)

APPOINTMENTS VACANT

BRITISH ELECTRICITY AUTHORITY

North Western Division

APPLICATIONS are invited for the following superannuable positions:—

No. 578. STATION SHIFT CONTROL ENGINEER.
Padiham Generating Station.

The salary for this post will be in accordance with Grade 10, Class "E" of the N.J.B. Agreement, i.e. £535 to £549 per annum.

Candidates should have had a good technical education, preferably up to Higher National Certificate standard.

No. 594. SHIFT CHARGE ENGINEER.
Radcliffe Generating Station.

The salary for this post will be in accordance with Grade 7, Class "F" of the N.J.B. Agreement, i.e. £677 to £696 per annum.

Candidates should possess a Higher National Certificate and have had experience in a generating station.

Applications quoting vacancy number, stating age, qualifications, present position, and giving full details of education and experience, should be received by the Establishment Officer, British Electricity House, Wilmslow Road, East Didsbury, Manchester 20, not later than November 7, 1951. (P 44)

SOUTHERN ELECTRICITY BOARD

APPLICATIONS are invited for the following post:—
REFRIGERATION REPRESENTATIVE
Oxford District of No. 2 (Newbury) Sub-Area. Salary N.J.C. Grade 3 (£500 to £560 per annum). N.J.C. conditions of service.

Candidates should have a knowledge of the theory of refrigeration, be capable of designing the layout of commercial refrigeration plant, supervising the installation of equipment and conducting negotiations.

The successful candidate will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary and returned to him in envelopes endorsed "Refrigeration Representative, Oxford District," at 7 Oxford Road, Newbury, not later than November 12, 1951.

F. W. KEMPTON,
Secretary.

November 1, 1951. (P 50)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS are invited for the appointment of GENERAL ASSISTANT ENGINEER (Metering) in the Technical Department of this Divisional Headquarters, at a salary in accordance with Class "AX.CX," Grade 8 (£481 to £655 per annum) of the revised National Joint Board Agreement, the commencing salary to be dependent on experience.

Applicants should possess a Higher National Certificate in Electrical Engineering or an equivalent qualification and have had experience in maintenance and testing of polyphase metering equipment. Experience in a Class "A" polyphase testing station will be considered an advantage.

The appointment is superannuable in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

Forms of application may be obtained from the Divisional Secretary at the address below to whom completed forms should be returned not later than November 17, 1951.

H. V. PUGH,
Divisional Controller.

British Electricity Authority,
Cardiff (Pengam Moors) Airport, Cardiff.
October 26, 1951. (P 48)

EASTERN ELECTRICITY BOARD

Chilterns Sub-Area

APPOINTMENT OF THIRD ASSISTANT ENGINEER (PLANNING AND DEVELOPMENT SECTION). 114/51. N

APPLICATIONS are invited for the appointment of a Third Assistant Engineer in the Planning and Development Section on the staff of the Sub-Area Engineer at Bedford.

The duties of the post include supervision of the Drawing Office and assistance in the design and planning of distribution schemes for urban and rural systems at voltages up to 33 kV.

The salary will be in accordance with Class "K," Grade 10 of the National Joint Board Salary Agreement, commencing at £699 per annum. Both future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Candidates who have submitted applications in response to the previous advertisement will be considered for the above post.

Applications stating age, education, technical qualifications and experience, with details of present appointment and salary, should be submitted to The Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend Street, Bedford, within 14 days of the appearance of this advertisement.

October 23, 1951. (P 51)

SOUTH EASTERN ELECTRICITY BOARD

DEMONSTRATOR
Medway District

SALARY £360 by 20 to £440 p.a. under N.J.C. Agreement Grade 1. Superannuation will be arranged. Duties include demonstration of domestic electrical appliances at consumers' houses, in showrooms and public halls, and general showroom duties. Appropriate domestic science or housecraft qualifications an advantage.

Applications, giving two referees, must reach H. F. Knell, J.P., M.I.E.E., Kent Manager, SEEBoard, 178/184, High Street, Rochester, by November 12, 1951.

DRAUGHTSMAN
Dorking District

Salary £500 by £20 to £560 p.a. under N.J.C. Agreement Grade 3. Superannuation will be arranged. Duties include the supervision of cartographic and recording works in the district drawing office, the keeping of mains and substation records, preparation of maps and distribution diagrams.

Application forms obtainable from S. Gill, A.I.E.E., Dorking Manager, SEEBoard, 56 South Street, Dorking, Surrey, to be returned by November 14, 1951.

A. L. BURNELL,
Secretary.

October, 1951 (P 41)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the position of STATION SHIFT CONTROL ENGINEER at Walsall Generating Station. Salary will be in accordance with Class "G," Grade 10 of the National Joint Board Agreement commencing at £588 per annum.

Applicants should possess the Higher National Certificate in electrical engineering or equivalent qualification, and should have had a sound technical training and practical experience in the control and operation of steam generating plant and main switchgear.

Salary and conditions of service will be in accordance with the N.J.B. Agreement, and superannuation under terms approved by the British Electricity Authority.

Applications should be made on forms which may be obtained from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, and be returned not later than November 17, 1951.

F. W. LAWTON,
Divisional Controller.
(P 43)

NORTHAMPTON POLYTECHNIC

ST. JOHN STREET, E.C.1

APPLICATIONS are invited for vacancy on full-time LECTURING STAFF OF THE ELECTRICAL ENGINEERING DEPARTMENT.

Candidates should possess a university degree in engineering or equivalent qualification and have had practical experience in the electrical industry.

Salary in accordance with the London Technical Burnham Scale, Grade "B," viz.: £450 by £25 to £725 with allowance of £60 for graduates or equivalent and up to £54 for training, plus London allowance of £36 (£48 if over 37).

Particulars and form of application from Secretary.

J. E. RICHARDSON, Ph.D., B.Eng., M.I.E.E.,
Principal.
(P 53)

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division

MAINTENANCE ENGINEER (MECHANICAL)
KEADBY POWER STATION

APPLICATIONS are invited for the position of Maintenance Engineer (Mechanical) at Keadby Power Station, near Scunthorpe. The station will have a capacity of 120 MW initially which will increase to an ultimate capacity of 360 MW.

Applicants should have had a sound practical training and experience in the maintenance of large turbo alternators and boilers, and should be able to take control of the maintenance staff and machine shop.

Preference will be given to engineers who are Corporate Members of the Institution of Electrical Engineers and/or the Institution of Mechanical Engineers, or who hold the necessary qualifications for membership.

Conditions of service and salary will be in accordance with the National Joint Board Agreement (Schedule "A"), Class "G," Grade 7, £704 to £733 per annum. The appointment will be subject to the provisions of the Authority's Superannuation Scheme.

Forms of application may be obtained from the Divisional Secretary (Establishments), British Electricity Authority, Yorkshire Division, St. Mary's Road, Leeds 7, to whom completed forms should be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(P 57)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the position of OPERATION and EFFICIENCY ENGINEER at Ironbridge Generating Station. Salary will be in accordance with Class "H," Grade 5 of the National Joint Board Agreement commencing at £890 per annum.

Candidates should preferably possess a university degree in engineering or be corporate members of the Institution of Electrical or Mechanical Engineers, but applicants who hold the Higher National Certificate in electrical and mechanical engineering or equivalent qualifications will receive consideration.

The successful applicant will be responsible for the efficient operation and maintenance of the generating station plant and previous experience in a large power station is essential.

Conditions of service will be in accordance with the N.J.B. Agreement, and the superannuation under terms approved by the British Electricity Authority.

Forms of application may be obtained from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, and should be returned not later than November 17, 1951.

F. W. LAWTON,
Divisional Controller.
(P 4)

BRITISH ELECTRICITY AUTHORITY

Southern Division S/13.261

APPLICATIONS are invited for the position of ASSISTANT SHIFT CHARGE ENGINEER at Portsmouth Generating Station.

The salary will be in accordance with Grade 9, Class "G," of the National Joint Board's Schedule, namely £621 to £648 per annum.

Applicants should preferably be in possession of technical qualifications admitting to corporate membership of a recognised professional institution, have had previous experience in a large modern generating station, and also have had manufacturing works experience.

Application forms may be obtained from the undersigned and should be returned not later than November 16, 1951.

P. D. A. OLIVER,
Divisional Secretary.

British Electricity House,
High Street, Portsmouth. (P 56)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, a JUNIOR ENGINEER (Protection) in the Eastern Sub-Area, Cwmbran.

Preference will be given to applicants who possess the Higher National Certificate or its equivalent or who have passed the graduateship examination of the Institution of Electrical Engineers.

The salary for the position will be in accordance with Grade 18, Class "J" (£375 to £478) of the N.J.B. Schedule.

Applications stating age, present position and salary, qualifications and experience and giving three referees to be addressed to the Secretary (Establishments), South Wales Electricity Board, St. Mellons, Cardiff, so as to reach him by November 10, 1951.

D. G. DODDS,
Secretary.
(P 46)

NORTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER (SERVICE ENGINEER)—CENTRAL DISTRICT

Duties include the control and supervision of industrial and domestic contract wiring sections and preparation of specifications.

Salary scale: £704-£733 per annum. Grade G.7. N.J.B. conditions.

Applications to Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by November 10, 1951.

GENERAL ASSISTANT ENGINEER (TECHNICAL ASSISTANT) FOR SYSTEM PLANNING AND DEVELOPMENT, NO. 2 SUB-AREA HEADQUARTERS (Re-issue)

Candidates should have had a sound training in electrical engineering and be competent to assist in the preparation of schemes and estimates for extensions to the h.v. and l.v. systems up to 33 kV, and in the design and layout of substations. Preference given to candidates with experience of protective gear systems and an aptitude for system calculations.

Salary grade: L.13, £596-£610-£625 per annum. N.J.B. conditions.

DISTRICT COMMERCIAL ENGINEER—BURY DISTRICT

Duties include:—

Supplying information and advice to consumers on electricity utilisation, tariffs, terms, apparatus, wiring schemes and specifications, electricity service and consumer negotiations;

Organisation and supervision of industrial and domestic installation work, maintenance service (including standby), routine testing and repair of domestic appliances and control of workshops and stores;

Control of showrooms, demonstrations, exhibitions and publicity;

Organisation and supervision of consumer records.

Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary scale: £887-£925 per annum. Grade F.3. N.J.B. conditions.

Applications for the above posts to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester 3, by November 10, 1951.

ASSISTANT (WAYLEAVES)—KENDAL DISTRICT

Applicants must be experienced in negotiating wayleaves, the keeping of registers, and settlement of claims for damages arising out of the construction of supply lines. The successful applicant will be required to reside in the district.

Salary scale: £440-£500 per annum. N.J.C. conditions.

Applications to Sub-Area Manager, No. 6 (Lakeland) Sub-Area, The North Western Electricity Board, Castle Green, Kendal, by November 10, 1951.

(P 29)

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division

KEADBY POWER STATION

APPLICATIONS are invited for the following appointments at Keadby Power Station. The station, which is situated near Scunthorpe, North Lincs., will have an initial capacity of 120 MW which will rise to an ultimate capacity of 360 MW and will be equipped with 60 MW Turbo-Alternators and 550 k/lbs hr. Pulverised Fuel Fired Boilers.

The appointments will be subject to the provision of the Authority's Superannuation Scheme and to conditions of service and salary in accordance with the National Joint Board Agreement.

(a) SHIFT CHARGE ENGINEERS commencing salary Class "G," Grade 7, £704 per annum.

(b) STATION SHIFT CONTROL ENGINEERS commencing salary Class "G," Grade 10, £588 per annum.

(c) JUNIOR ENGINEERS commencing salary Class "G," Grade 16, £375 per annum.

Applicants for positions (a) and (b) must have had a sound technical training and experience in the operation of a modern Generating Station, and preference will be given to candidates who are Corporate or Graduate Members of the Institution of Electrical Engineers and/or Institutions of Mechanical Engineers, or who hold equivalent qualifications. P.F. experience will be an advantage. For position (c) preference will be given to candidates who hold the Higher National Certificate in Electrical or Mechanical Engineering.

Forms of application may be obtained from the Divisional Secretary (Establishments), British Electricity Authority, Yorkshire Division, St. Mary's Road, Leeds 7, to whom completed forms should be returned within fourteen days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.

October 22, 1951. (P 7)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable appointments.

SHIFT CHARGE ENGINEERS
Brunswick Wharf Generating Station

Candidates should have received a sound technical training in electrical and mechanical engineering and practical experience in the operation and maintenance of a modern generating plant with pulverised fuel fired boilers. Character and ability to deal with staff problems is important.

Salary and conditions in accordance with N.J.B. Schedule, Class "G," Grade 7 (based on first section) plus London Allowance is £739 4s. per annum.

BOILER HOUSE SHIFT CHARGE ENGINEER
Deptford West Generating Station

Candidates should have received a sound technical training and preferably have gained a National or Higher National Certificate in either electrical or mechanical engineering. They must also have received a sound engineering training and have had experience in the operation of modern boiler plant and in the combustion of solid fuels.

Salary and conditions in accordance with N.J.B Schedule, Class "J," Grade 9, plus London Allowance is £733 19s. per annum.

SHIFT CHARGE ENGINEER
Lombard Road Generating Station

Candidates should have technical qualifications up to Higher National Certificate standard, together with a good general education. Considerable experience in the efficient operation of turbo alternators and boiler plant is essential. Character and ability to deal with staff problems is important.

Salary and conditions in accordance with N.J.B. Schedule, Class "F," Grade 7, plus London allowance is £710 17s. per annum.

Applications for the foregoing positions, stating age, qualifications and experience, should be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, to be received within 14 days of the appearance of this advertisement.

J. N. WAITE,
Divisional Controller.
(P 42)

BRITISH ELECTRICITY AUTHORITY

South Western Division

SHIFT CHARGE ENGINEER
CASTLE MEADS POWER STATION

APPLICATIONS are invited for the position of Shift Charge Engineer at Castle Meads Power Station, Gloucester.

Candidates should have had a good technical experience, a sound knowledge of the operation and maintenance of generating plant and preference will be given to applicants possessing the Higher National Certificate or equivalent qualifications.

Salary and conditions of service will be in accordance with the National Joint Board Agreement Class "E", Grade 7, £629 to £660.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards Superannuation Scheme.

Applications, stating age, qualifications, experience, present appointment and salary, should be addressed to the Divisional Secretary, British Electricity Authority, South Western Division, British Electricity House, 26 Oakfield Road, Clifton, Bristol 8, so as to be received not later than November 10, 1951.

R. C. BARRETT,
Divisional Secretary.

October 24, 1951. (P 1)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the position of ASSISTANT MAINTENANCE ENGINEER (Mechanical) at Ironbridge Generating Station, Class "H", Grade 8, commencing salary £897 per annum.

Applicants should have had sound technical training and should be well experienced in power station mechanical maintenance. Candidates should possess at least the Higher National Certificate in mechanical engineering or an equivalent qualification.

Salary and conditions of service will be in accordance with the N.J.B. Agreement, and superannuation under terms approved by the British Electricity Authority.

Applications should be made on forms which may be obtained from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, and should be returned not later than November 17, 1951.

F. W. LAWTON,
Divisional Controller.
(P 3)

BRITISH ELECTRICITY AUTHORITY

Southern Division S.13.262

APPLICATIONS are invited for the position of STATION CHEMIST at Oxford Generating Station.

Applicants should preferably be qualified analytical chemists (or with Higher National Certificate) with knowledge of the sampling and analysis of fuels, water treatment in connection with boilers and oil testing.

Experience in the operation and maintenance of boiler house instruments and associated technical work will be an advantage. The position offers scope to a young man with generating station laboratory training wishing to enlarge his experience.

The salary will be in accordance with Grade 7, Class "D" of the National Joint Board Schedule, at present £613 to £623 per annum.

Forms of application may be obtained from the undersigned and should be returned not later than Friday, November 16, 1951.

P. D. A. OLIVER,
Divisional Secretary.

British Electricity Authority,
High Street, Portsmouth. (P 55)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointment:—

No. 6 (Hull) Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER
(Bridlington) (Vacancy No. 138/51)

Applicants should have had sound practical experience in the operation, maintenance, planning and construction of h.v. and l.v. underground and overhead lines and substations in an extensive rural area.

Preference will be given to candidates who are Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications.

The successful candidate would be required to undertake standby duty and to reside in Driffield.

Salary: N.J.B. Agreement, Class "D," Grade 7, £613-£623 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, within 14 days of the appearance of this advertisement.

(P 28)

MIDLANDS ELECTRICITY BOARD

Wolverhampton and District Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER

APPLICATIONS are invited for the above appointment in the Walsall District of the Wolverhampton and District Sub-Area.

The conditions of service will be in accordance with the N.J.B. Agreement, and the salary will be Class "F," Grade 7, £677 to £696 per annum.

Applicants should have technical qualifications equivalent to those required for Corporate Membership of the Institution of Electrical Engineers and have experience in the construction, maintenance and operation of industrial and Urban High and Low voltage networks. Experience of converter and rectifier equipment and traction systems will be an advantage. The successful candidate will be expected to undertake standby duties.

Applications, stating age, qualifications, experience and present post and salary, should be forwarded within 14 days to F. J. Elliott, Esq., M.I.E.E., Sub-Area Manager, 83 Darlington Street, Wolverhampton.

A. STEPHENS,
Secretary.

October 19, 1951. (P 8)

CROWN AGENTS FOR THE COLONIES

INSPECTOR OF WORKS (TEMPORARY) (Distribution Section) required by the Government of Sierra Leone for the Electricity Branch, Public Works Department, for one tour of 18 to 24 months in the first instance. Salary, according to age, £808 or £875 a year, including expatriation pay and temporary allowance. Gratuity of £15 for each completed period of three months on satisfactory completion of service. Outfit allowance £60. Free passages. Liberal leave on full salary. Candidates, not over 40 years of age, must have served an apprenticeship in the distribution section of an electricity undertaking; have had extensive experience in the overhaul and repair of power transformers, H.T. and L.T. switchgear, etc.; and have had some years of practical experience in the jointing of underground cables up to 11 K.V. Apply at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting M.28554/B on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (P 2)

BRITISH ELECTRICITY AUTHORITY

Merseyside and North Wales Division

APPLICATIONS are invited for the appointment of OPERATION and EFFICIENCY ENGINEER at the Southport Power Station. Salary £694 to £708 per annum being Class "D," Grade 5, of the N.J.B. Schedule. This grade should be regarded as provisional pending confirmation by the National Joint Board.

Applicants must have had good experience in power station practice, particularly in regard to the efficient operation of all plant in a generating station. The possession of the Higher National Certificate, or equivalent qualifications, will be an advantage.

The appointment is superannuable under the British Electricity Authority and Area Boards' Superannuation Scheme, and subject to a medical examination.

Forms of application may be obtained from the Divisional Secretary, Clarke Gardens, Woolton, Liverpool, and should be returned to him not later than Wednesday, November 14, 1951.

A. R. COOPER,
Divisional Controller.
(P 5)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of ASSISTANT SECTION ENGINEER in the Widnes section of the Runcorn District of the Board's No. 2 Sub-Area. Salary: N.J.B., G. 9 (£621-£648).

Applicants should preferably have the technical qualifications to enable them to become Chartered Electrical Engineers and have had experience in the h.v. and m.v. overhead and underground distribution work. The successful applicant will be required to undertake standby duties.

The appointment is superannuable and subject to medical examination.

Applications, stating age, experience, qualifications and present appointment, should be submitted to the Manager, Ref. 13A, No. 2 Sub-Area, Merseyside and North Wales Electricity Board, Sandiway House, near Northwich, Cheshire, not later than November 12, 1951.

JAMES RANKIN,
Secretary.
(P 27)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

JUNIOR ENGINEERS, HINCKLEY AND WARWICK

APPLICATIONS are invited for positions as Junior Engineers at Hinckley and Warwick Generating Stations.

Applicants should have had a sound technical training and experience in power station operation would be an advantage.

Salary will be in accordance with Class "E," Grades 15/14 at Warwick and Class "B," Grade 12 at Hinckley, of the National Joint Board Agreement.

The posts will be superannuable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, British Electricity House, Barker Gate, Nottingham and should be returned not later than November 12, 1951.

L. F. JEFFREY,
Divisional Controller.
(N 216)

CITY OF BULAWAYO

Southern Rhodesia

VACANCY FOR OVERHEAD MAINS ENGINEER—ELECTRICITY DEPARTMENT

APPLICATIONS are invited for the above position on the salary grade £878 8s. by £25 to £1,022 8s. per annum, plus a cost of living allowance at present fixed at a rate of approximately 12½% of basic salary.

Further details in connection with the vacancy may be obtained on application to the Council's London Agents, Messrs. Davis & Soper, Limited, 52 and 54 St. Mary Axe, London, E.C.3.

Applications must be sent by AIR MAIL to the Town Clerk, P.O. Box 591, Bulawayo, Southern Rhodesia, so as to reach him by not later than noon on Saturday, November 24, 1951.

H. J. COOK,
Town Clerk.

October 22, 1951. (P 6)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

SOUTH WALES ELECTRICITY BOARD

REQUIRED, an ASSISTANT ENGINEER in District 464, Abergavenny, in the Eastern Sub-Area.

Candidates should have experience in construction and maintenance of mains and substations in a rural area and possess at least the Ordinary National Certificate in Electrical Engineering.

The salary will be in accordance with Class "C," Grade 10 (£482 to £501) of the N.J.B. Schedule.

Applications stating age, present position and salary, qualifications and experience and giving three referees to be addressed to the Secretary (Establishments), South Wales Electricity Board, St. Mellons, Cardiff, so as to reach him by November 10, 1951.

D. G. DODDS,
Secretary.
(P 47)

HOSPITAL MANAGEMENT COMMITTEE

Hastings Group

APPLICATIONS are invited for the post of ELECTRICIAN in the Group Works Department, rate of pay in accordance with the National Supply Industry, the current rate being 3s. 2½d. per hour for a 48-hour week.

The post will be subject to hospital conditions of service and superannuation after two years' employment.

Applications, stating age and experience, together with copies of two recent testimonials, should be forwarded to the Group Engineer at the address below, within seven days of this advertisement.

H. A. FROGGATT,
Secretary.

11, Holmesdale Gardens,
Hastings. (P 58)

AN ELECTRICAL ENGINEER is required by a well-known Company for interesting work in the London area. Good all round knowledge of d.c. and a.c. machines of up to 50 h.p. and their control gear is essential. Applicants should be familiar with marine applications of these machines and be capable of preparing specifications and vetting and testing of designs.—Write, giving full details, mentioning ref.: IDA, to Box No. 1165, Electrical Times. (P 15)

APPLICATIONS are invited from ELECTRICAL CONTRACTS ENGINEERS for handling orders for steel works installations and other metal industries projects, both as respects power units and associated control schemes. Preference will be given to applicants between 25 and 35 years of age who have served recognised apprenticeship, hold at least Higher National Certificate and have had previous manufacturing contractual experience. Permanent progressive positions, pension scheme. Successful applicants will have to find own accommodation, but for a limited period arrangements will, in appropriate cases, be made for special financial assistance.—Apply, stating age, qualifications, experience and quoting Ref. 489B, to Central Personnel Services, English Electric Co. Ltd., 24/30 Gillingham Street, London S.W.1. (N 139)

ASSISTANT ELECTRICAL ENGINEER required for Construction Project in Kent. Must be versatile, active, age not over 40. Technical Education to Higher National Certificate desirable. Practical experience in Lighting and Power installations, cables, motor and switch gear assemblies. Knowledge of flame-proof installations an advantage.—Apply in writing to Geo. Wimpey and Co. Ltd., Dept. 1, Hammersmith Grove, London, W.6. (N 228)

ASSISTANT ENGINEER required with experience of cable installation work, estimating and taking off quantities.—Write in confidence, stating qualifications, experience and salary required, to Cable Dept., Edison Swan Electric Co., Ltd., 155 Charing Cross Road, London, W.C.2. (N 238)

ASSISTANT WAYLEAVE OFFICER required in the Wellington and Shrewsbury Districts. Applicants should have some knowledge of valuation, compensation, surveying and levelling, and be competent to assist in the negotiation of wayleave agreements. Salary and conditions of service will be in accordance with the National Joint Council, Grade 1, £360-£440 per annum. The successful applicant will be required to contribute to the Board's Superannuation Scheme if eligible.—Applications, stating age, education and experience, within 14 days to Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury. (P 32)

DRAUGHTSMEN required, preferably with experience in any branch of high-tension and low-tension electrical switchgear, switchboard layout, and diagrams of connections, or electrical control gear. Applications from good mechanical draughtsmen and designers are also invited.—Apply, quoting "Switchgear" and stating age, experience and salary required, to the General Electric Co., Ltd., Engineering Works, Witton, Birmingham 6. (N 127)

B.B.C. requires ENGINEER in Wiring Unit of Planning and Installation Department. Applicants should preferably have served a term of apprenticeship with a reputable firm of electrical contractors and have had considerable experience in planning, supervising and testing low and medium pressure electrical installation work. Duties include planning such work for various studios and offices, preparation of estimates and specifications, supervision and testing of contractors work and conduct of correspondence. The vacancy is in London but visits throughout Great Britain and Northern Ireland will be necessary from time to time. Salary £565 (possibly higher if qualifications exceptional) with five annual increments to maximum £725 per annum.—Applications to reach Engineering Establishment Officer, Broadcasting House, London W.1, within 7 days. (P 9)

CROMPTON PARKINSON LTD., invite applications for the position of TESTING ENGINEER in their battery factory at Newport, Mon. Candidates should be aged 25 to 35 and have had training in Electrical Technology as applied to lead acid batteries. They should preferably have had previous experience in this type of testing work. The successful applicant will be required to spend a brief training period in the London area before taking up the post in Newport. Lodging allowance is payable during this training period. Five-day week; superannuation fund.—Apply giving details of education, training, experience and salary required to Personnel Officer, Young Accumulator Co., Ltd., Malden Way, New Malden, Surrey. (P 13)

DESIGN DRAUGHTSMAN required for interesting work on small mass produced electro-mechanical devices. Progressive post.—Write full details of experience and salary required to Box No. 1159, Electrical Times. (N 222)

DRAUGHTSMAN required for Contracts Section, experienced on flat back and cubicle type switchgear and able to do diagrams. Good salary offered for suitably qualified applicant. Pension scheme available.—Reply, stating age, salary, and full details of technical qualifications and experience to Erskine, Heap & Co. Ltd., Lancashire Switchgear Works, Salford, Manchester 7. (N 237)

EAST AFRICA, RESIDENT ENGINEER with sound technical and commercial training required to take charge of office in Tanganyika. Duties would involve sales of all types of electrical and industrial equipment and the preparation of reports and schemes for industrial projects. Single man preferred, three-year contract, salary approximately £1,000 per annum plus housing, cost of living allowance, free passages and leave on full salary.—Apply by letter, giving full particulars of qualifications, experience and marital status, to Box No. 1185, Electrical Times. Applications should be posted by not later than 14 days after the publication of this advertisement. (P 60)

ELECTRICAL TRANSFORMER DESIGNER required with experience of transformer design up to 500 kVA. Able to take full responsibility.—Apply, giving full details of experience and salary anticipated, to Woden Transformer Co. Ltd., Moxley Road, Bilston, Staffs. Tel. 41959. (N 236)

ELECTRICAL wholesaler requires REPRESENTATIVES for Kent, Sussex, Surrey and Hants, to take over existing connections and extend business. Applicants must be car owners, have previous experience and some connections in the area. Accommodations could be arranged after trial period. Salary, commission and expenses paid.—Please write in strict confidence stating age, experience and references. Box No. 1183, Electrical Times. (P 49)

ENGINEERS, electrical and mechanical, with qualifications to degree or H.N.C. standard, are required for interesting experimental work on gyroscopes, small mechanisms and electro-mechanical devices at Stanmore (Middx). Good salaries and prospects offered.—Apply to the Staff Manager (Ref. GBLC/207), Research Laboratories of The General Electric Co., Ltd., Wembley, Middlesex, giving age, qualifications and record. (P 10)

EX R.N. ELECTRICAL and COMMUNICATIONS RATINGS wanted now for Royal Australian Navy. Engagement 6 years, excellent conditions and good chances of promotion. Free passage for whole family, but remember the housing situation is still critical. Australia has a fine sunny climate, plenty of good unrationed food, low taxes and full social services. Basic Daily Pay, General Scale: P.O., 33/-: Leading Ratings, 29/-: Able Rate, 26/-. Basic Daily Pay, Artificers' Scale: 1st Class, 36/3: 2nd Class, 35/6: 3rd Class, 34/9: 4th Class 32/-. General Allowances: Marriage, 6/-. Uniform, 1/9: each G.C. Badge, 4d. Vacancies for ex-Ratings: (a) of Leading Rate and above (Electrical): (b) below C.P.O. (Communications) discharged from R.N. not more than five years ago and not more than 39 years old (44 for Artificers).—Write for full details, stating whether married or single and enclosing R.N. Service Certificate, to R.A.N. Liaison Officer, Dept. ET, Canberra House, 87 Jermyn Street, London S.W.1. (P 16)

ELECTRICAL ENGINEER, age 20-25, required for editorial staff of old established technical journal. Previous journalistic experience unnecessary, but must be fully qualified engineer. Superannuated position. State salary required.—Box No. 1141, Electrical Times. (N 163)

HARRODS LTD. have vacancy for an ASSISTANT BUYER in their LAMPSHADES DEPARTMENT. Permanent pensionable post for suitable woman under 35.—Apply: Staff Manager, 44 Hans Crescent, S.W.1. (P 33)

IMPERIAL CHEMICAL INDUSTRIES, LTD., Wilton Works, has vacancies for ELECTRICAL DRAUGHTSMEN with experience in (a) layout of plant electrical installations, including motors, starters, distribution boards, cables and lighting, and necessary calculations, (b) layout of sub-stations, distribution cables and protective systems. Preference will be given to applicants who have had experience in chemical works or steelworks and who hold the Higher National Certificate or higher qualification.—Application forms may be obtained from the Staff Officer, Imperial Chemical Industries, Ltd., Wilton Works, P.O. Box 54, Middlesbrough, Yorkshire, quoting advertisement reference ICI/X/87/K. (P 52)

PLUMBER JOINTERS and MATES are required for factory installation work in the Midlands.—Write stating age and previous experience to Box No. 1175, Electric Times. (P 25)

PROFESSIONAL ENGINEERS IN GOVERNMENT DEPARTMENTS. The Civil Service Commissioners announce an open competition to be held during 1951 for permanent appointments in many departments of the Civil Service for a wide variety of engineering duties. Applications will be accepted at any time, but not later than December 31, 1951, and selected candidates will be interviewed as soon as possible after the receipt of their application forms. Candidates are advised to apply as early as possible. Age limits: Candidates must be under 35 on November 30, 1951, with extension for regular service in H.M. Forces and for established Civil Service. For appointments in the Post Office they must be 21 or over, in the Ministry of Supply, 23, and in all other departments, 25 or over on that date. Minimum qualifications vary for different posts. Generally a University degree in Engineering or Corporate Membership of the Institutions of Mechanical Engineers, Electrical Engineers or Civil Engineers, or passes in, or exemption from, Sections A and B of the corresponding Associate Membership examinations, or evidence of exceptionally high professional attainment are required. For certain posts, Corporate Membership of the Institute of Fuel by examination or the Institution of Chemical Engineers, or Graduate Membership of the Institution of Chemical Engineers, or Associate Fellowship of the Royal Aeronautical Society, or an Honours Degree in Physics will be accepted instead. The salary on appointment will be fixed according to age. The salary for men aged 25 in London is £575, rising by annual increments of £25 to £750, and by £30 to £900. Salaries for women and for posts outside London are lower. There are prospects of promotion to higher grades on scales for men in London of £900-£1,200, £1,250-£1,450 and above.—Further particulars and application forms from Secretary, Civil Service Commission, Trinidad House, Old Burlington Street, London W.1, quoting No. S85/51. (P 30)

MALES, TESTERS FOR ELECTRICAL MEASURING INSTRUMENTS. Experience desired but not essential. Good opportunities for young men with required electrical qualifications.—Write for interview, stating age and previous experience: Sangamo Weston Ltd., Cambridge Road, Enfield, Middlesex. (N 187)

RADIO ELECTRICIANS and ELECTRICAL FITTERS. Vacancies exist in the Dockyard Radio Centre, Admiralty Storage Depot, Risley, near Warrington, for trained radio and electrical craftsmen. Starting rate (44-hour five-day week) 129s. In addition a bonus of up to 8s. weekly is payable based on assessment of merit during first three months of service. Possibility of future advancement to 153s. weekly. Overtime rates for Saturday attendance. Assisted travel scheme in operation. Hostel accommodation available at 35s. weekly. Canteen meals provided at reasonable prices.

Apply to your local office of the Ministry of Labour for further particulars. (M 4)

REQUIRED by old established engineering firm in Malaya, fully qualified experienced ELECTRICAL ENGINEER as technical salesman. Sales and commercial experience an advantage, single man preferred, age not over 32. Salary according to age and experience.—Write, Box Z.J.642, Deacon's Advertising, 36 Leadenhall Street, E.C.3. (N229)

REQUIRED for Switchgear Department, TENDERING and CONTRACT ENGINEERS with experience of l.t. and h.t. switchgear up to 11 kV. Knowledge of 33 kV gear an advantage. Non-contributory pension scheme. Five-day week. Age 21 to 30. Possible housing assistance. Quote ref. RWS/CM.—Brush Electrical Engineering Co., Loughborough, Leicestershire. (P 14)

SALES ENGINEER required for preparation of motor control gear tenders.—Applications to be made in writing, stating previous training, experience and salary required, marking envelopes "Sales Engineer," to Personnel Manager, Metropolitan-Vickers Electrical Co. Ltd., Trafford Park, Manchester 17. (N 190)

TECHNICAL (ELECTRICAL) SALES ASSISTANT required by Pilkington Brothers Ltd., Glass Manufacturers, St. Helens, for their Power Line Insulator Department. Previous sales experience in the electrical industry and ability to handle correspondence essential. Qualifications: preferably H.N.C., but would consider O.N.C. Job will be internal to commence with, but may offer prospects for travelling later.—Applications should be addressed to the Chief Personnel Officer, Pilkington Brothers Ltd., St. Helens, Lancashire. (N 188)

THE Supermarine Works of Vickers-Armstrongs Ltd. have vacancies for DRAUGHTSMEN for component and installation work on radio, electrical, electronic and instrument installations in aircraft. Practical and D.O. experience desirable, but not essential.—Write, giving full details of experience and salary required, to Personnel Officer, Vickers-Armstrongs Ltd., Hursley Park, near Winchester. (P 31)

VENNER TIME SWITCHES LTD., require LABORATORY ASSISTANTS for development work: (1) Electro-Mechanical Devices. Minimum qualifications, Higher National or equivalent. (2) Accumulators. Similar experience essential in both cases.—Write, phone or call, Personnel Office, Venner Time Switches Ltd., Kingston-By-Pass, New Malden. (Malden 2442) (P 11)

WAYLEAVE OFFICER required in the Wellington and Shrewsbury Districts. Applicants should be experienced in the negotiation of wayleave agreements and have knowledge of valuation, compensation, surveying and levelling. Salary and conditions of service will be in accordance with the National Joint Council Grade 2. £440 to £500 per annum. The successful applicant will be required to contribute to the Board's Superannuation Scheme if eligible.—Applications, stating age, education and experience, within fourteen days, to: Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury. (P 17)

WELL-KNOWN Manufacturers of Lighting Equipment require full-time SALES REPRESENTATIVE for London area and Home Counties. Applicant should have a thorough knowledge of electrical accessories. Application should only be made by those who have an intimate knowledge of the trade; connection with, or some knowledge of, the technical side of the entertainment industry would be an advantage.—Write, giving fullest particulars, past experience, age, etc., Box No. 487, Rays, Cecil Court, London W.C.2. (P 62)

WORKS MANAGER required by electrical engineering firm. Works near Walsall. Only first-class men need apply.—Box No. 1163, Electrical Times. (P 12)

APPOINTMENTS WANTED

EXPERIENCED ELECTRICIAN requires contracting business, or partnership in going concern.—Box No. 1161, Electrical Times. (N 234)

OPERATOR, British, 37, 10 years' experience steam power plant overseas, seeks change, either home or abroad.—Write, BM/TBGK, London, W.C.1. (N 117)

TECHNICAL SALES REPRESENTATIVE, requiring change, seeks progressive situation. At present with C.M.A./E.L.M.A. manufacturer.—Box No. 1117, Electrical Times. (N 81)

WORK WANTED

A.C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed. Edgware 8631 (4 lines). —Service Electric Co., Ltd., Stanmore, Middx. (D 324)

CAPACITY available for REPETITION WOODWORK. Up-to-date machinery for the manufacture of tumbler switch boxes, fuseboard cases, wooden switch blocks and other electrical woodworking accessories. Also other repetition woodwork, storage boxes, platforms, etc.—Box No. 1177, Electrical Times. (P 34)

CASTINGS, Fisher Foundries, Ltd., Greet, Birmingham, have capacity for brass, gun metal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham. Victoria 0197. (L 318)

METALWORK. All types cabinets, chassis, racks, etc., to your own specifications.—Philpott's Metalworks Ltd., Chapman Street, Loughborough. (L 601)

WANTED

A.C./D.C. MOTORS, STARTERS, complete change-over installation, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (A 20)

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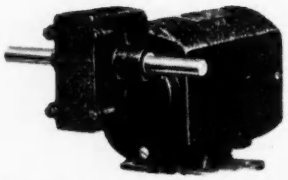

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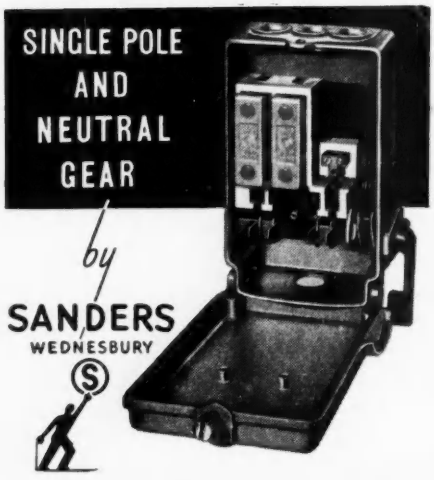

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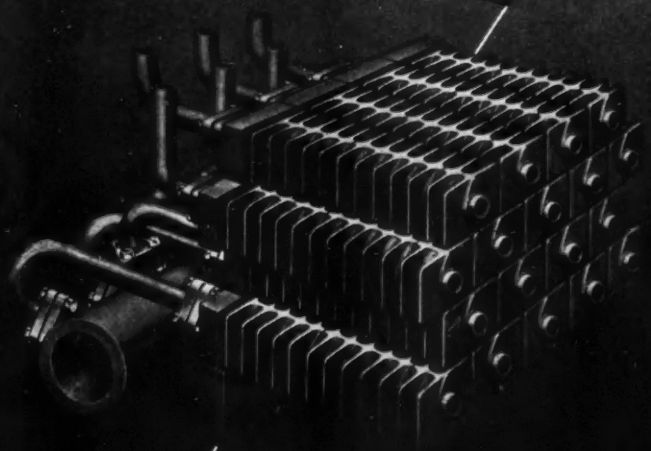

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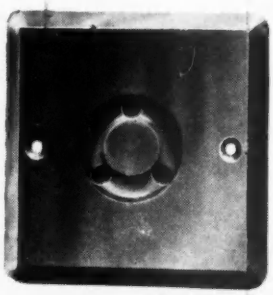

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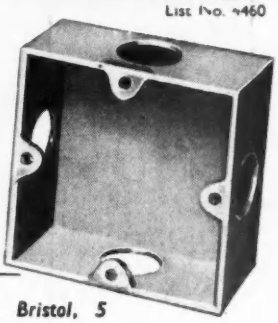

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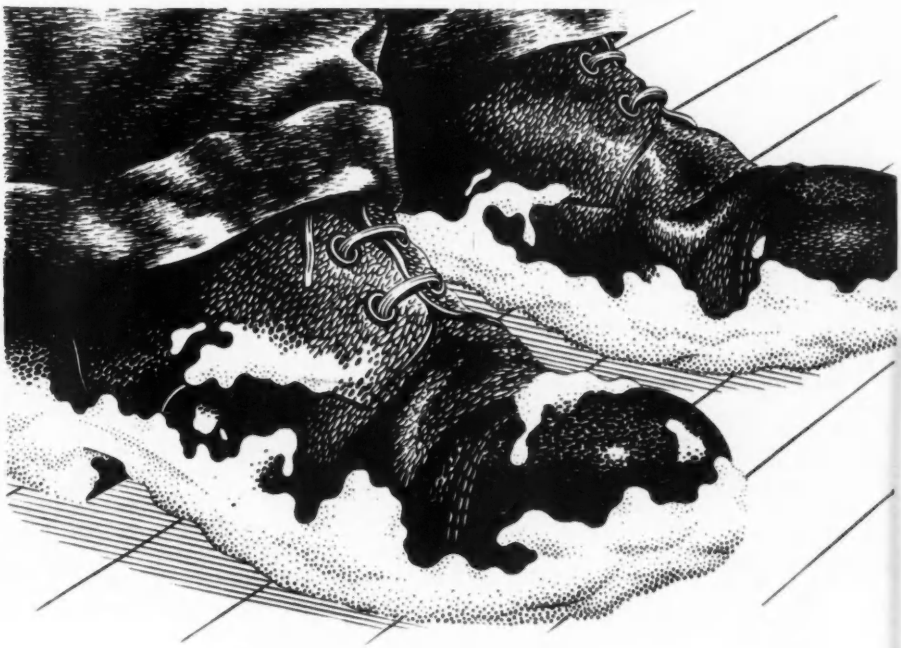

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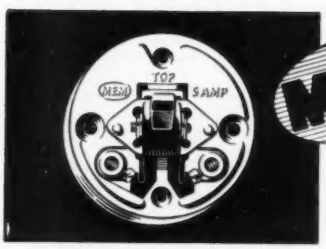

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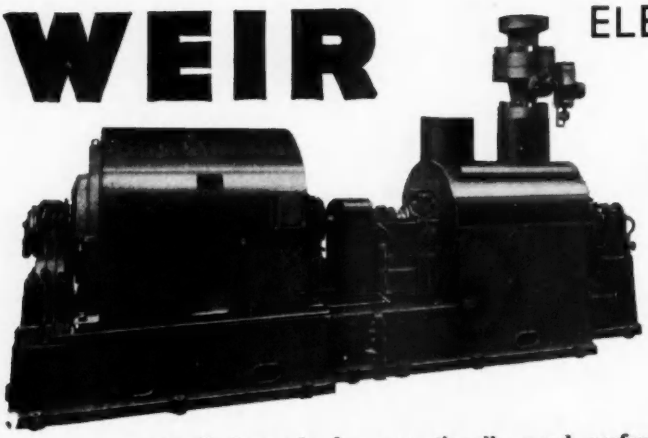

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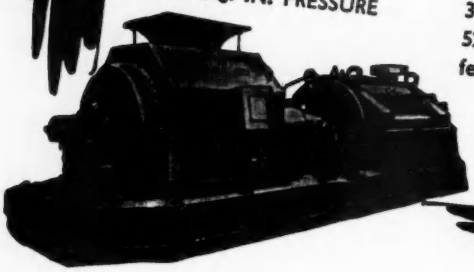

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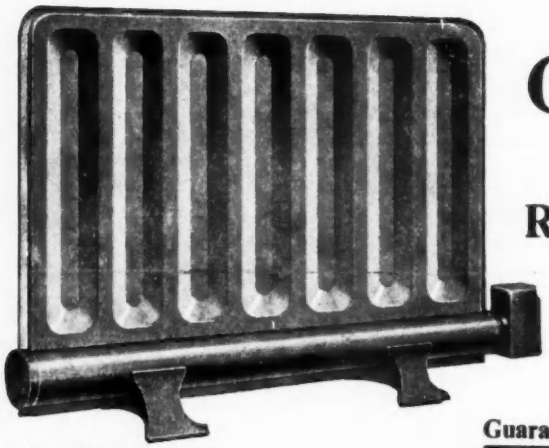

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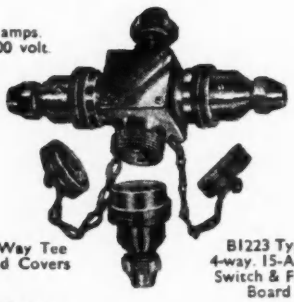

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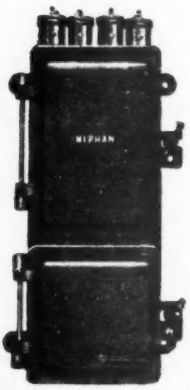

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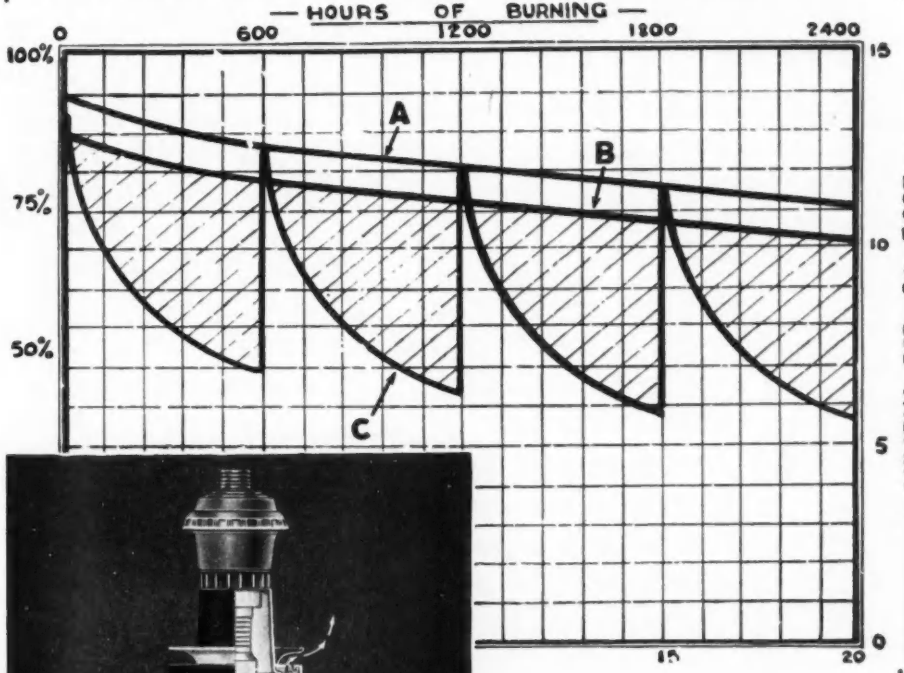

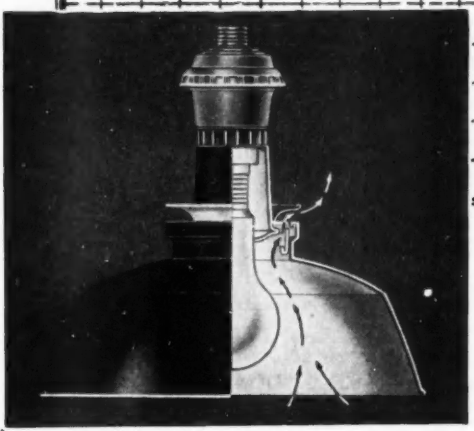

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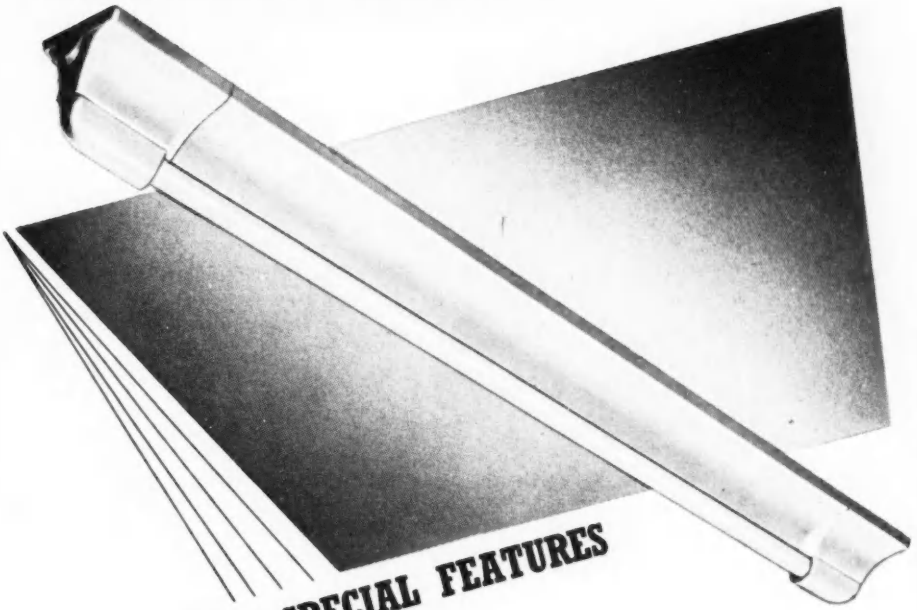

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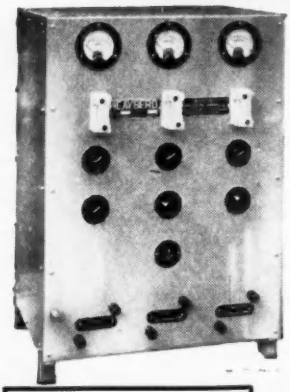

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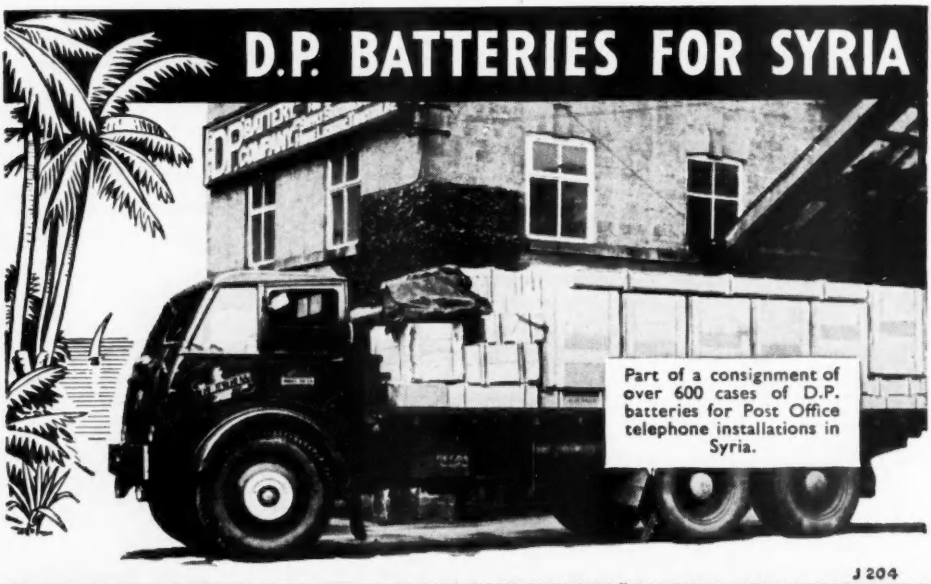

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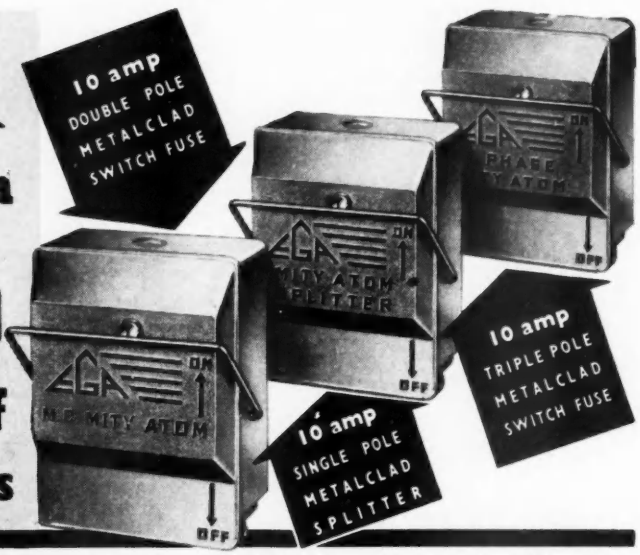

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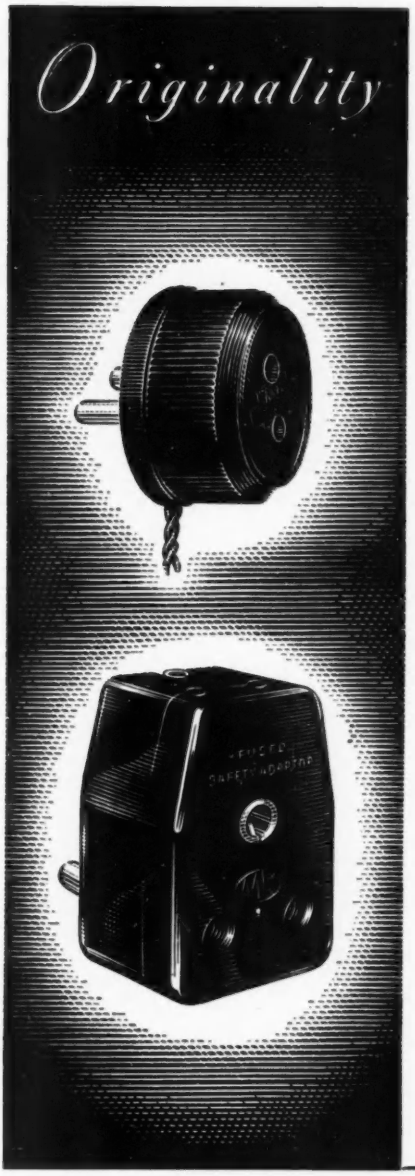

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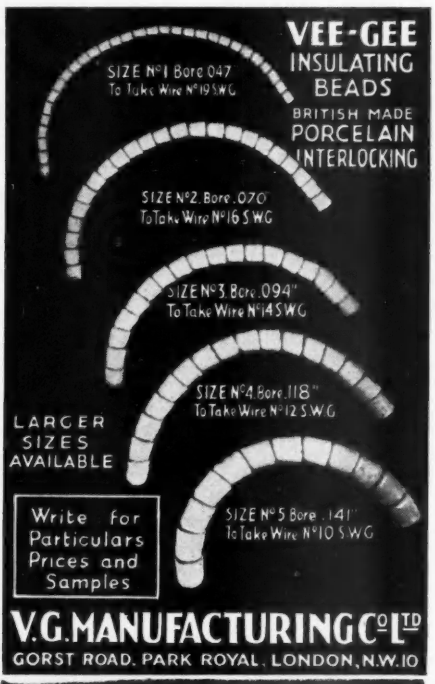
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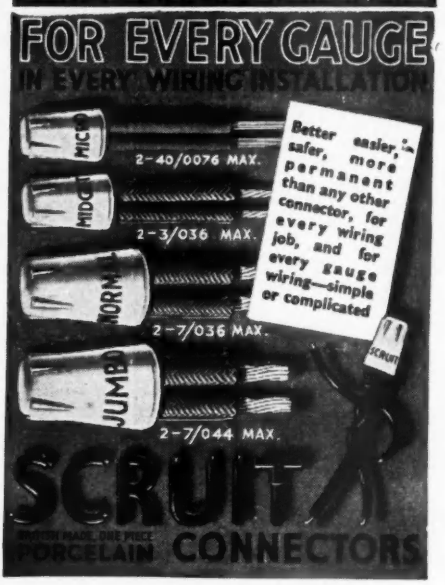

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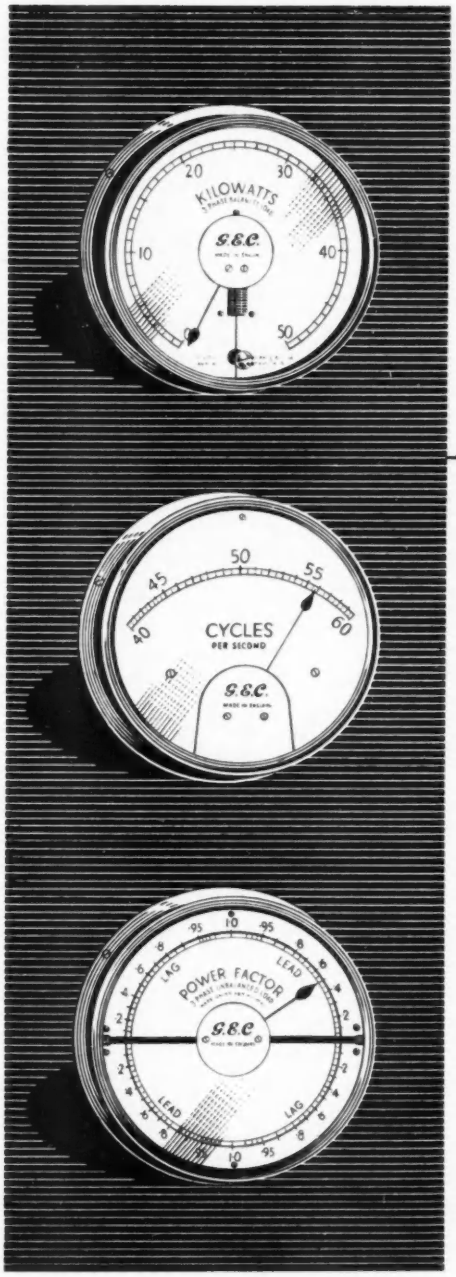

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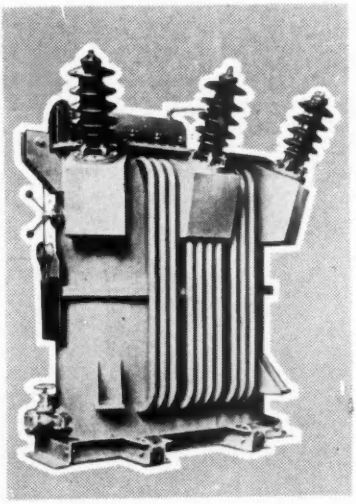

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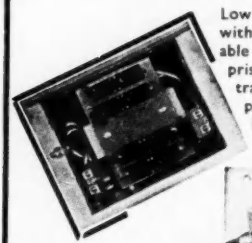

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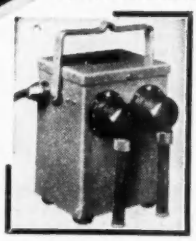

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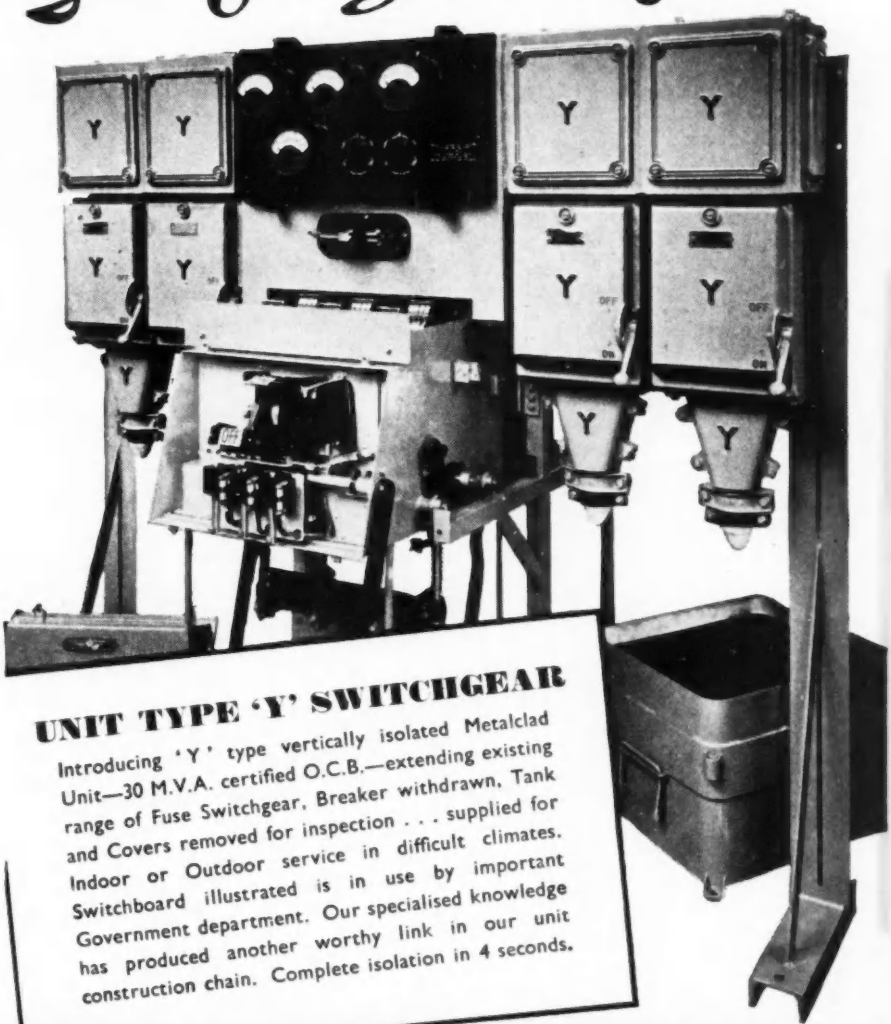

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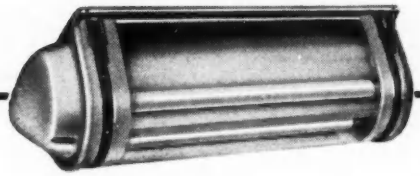

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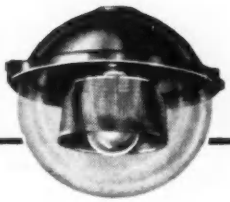

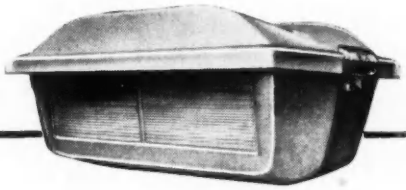

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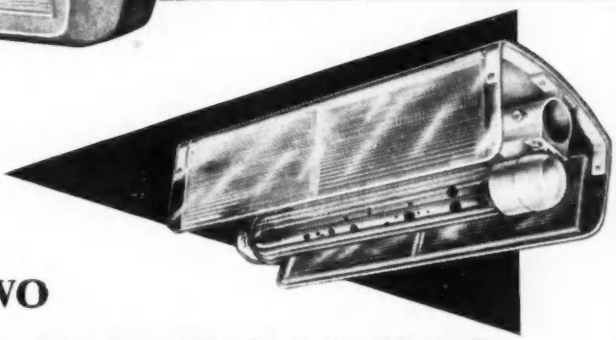

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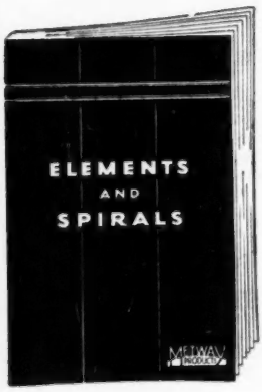

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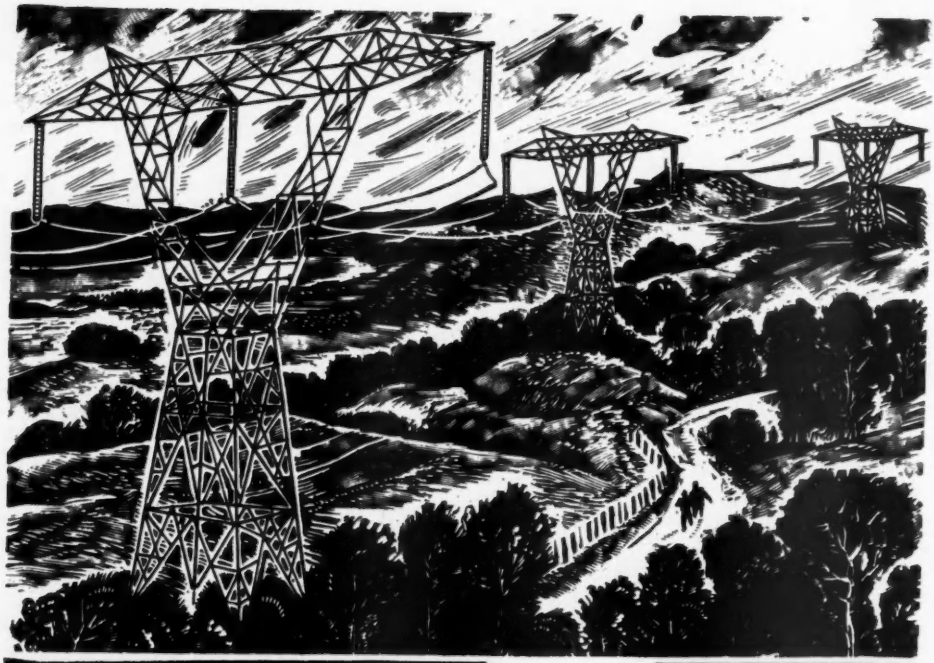

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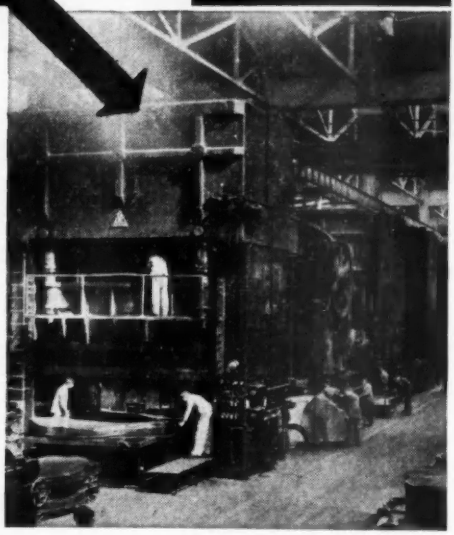

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PACKING FOR THE JOURNEY

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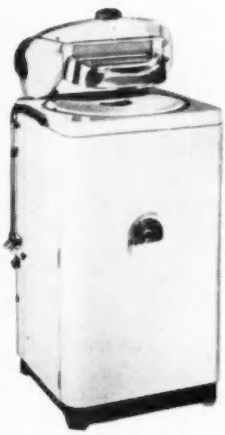

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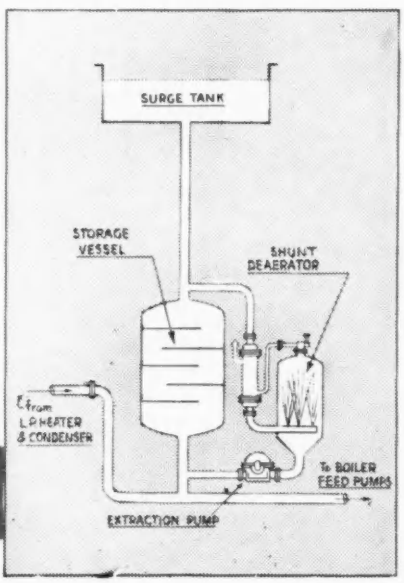
RELIABLE
ECONOMICAL

COMPLETELY AUTOMATIC IN ACTION

Available in all sizes.
Can be installed to work with existing feed systems.



HICK HARGREAVES AND COMPANY LTD BOLTON

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